NEW YORK SEATTLE

MOTORSHIP

Devoted to Marine Oil Engine and Motor Vessels

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EXCLUSIVE technical and non-technical articles on design, construction and operation of oil-engines and motorships by the world's foremost writers on marine engineering.

MOTORSHIP

PROFUSELY illustrated with photographic reproductions of the newest designs in international merchant motorship and Diesel-engine construction and auxiliary equipment.

(Trade Mark Registered)

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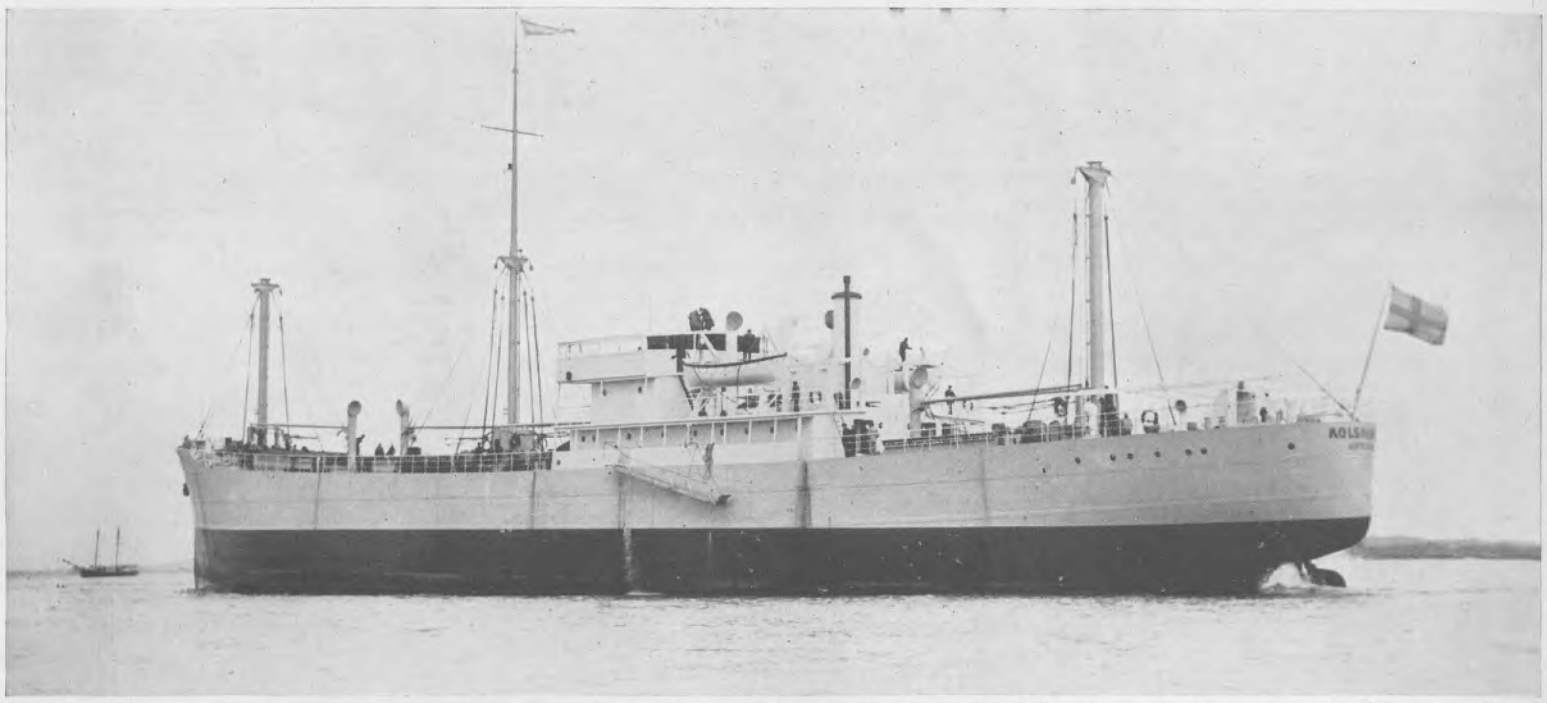
(Cable Address—Freemote, New York)

CONSERVATION OF FUEL-OIL

At the present time a vast fleet of steam-driven tankers are transporting oil from California through the Panama Canal to the Atlantic Coast, and for every 12 bbls. transported about one barrel is burnt. Were these tankers all Diesel driven there would be 35 bbls. carried for every barrel consumed. Let the oil companies lead the way to conservation by converting these tankers to Diesel drive. The above illustration represents the "Seminole," one of two Diesel-driven tankers built by Vickers Limited for the Anglo-American Oil Company. She has proven very economical and reliable in service

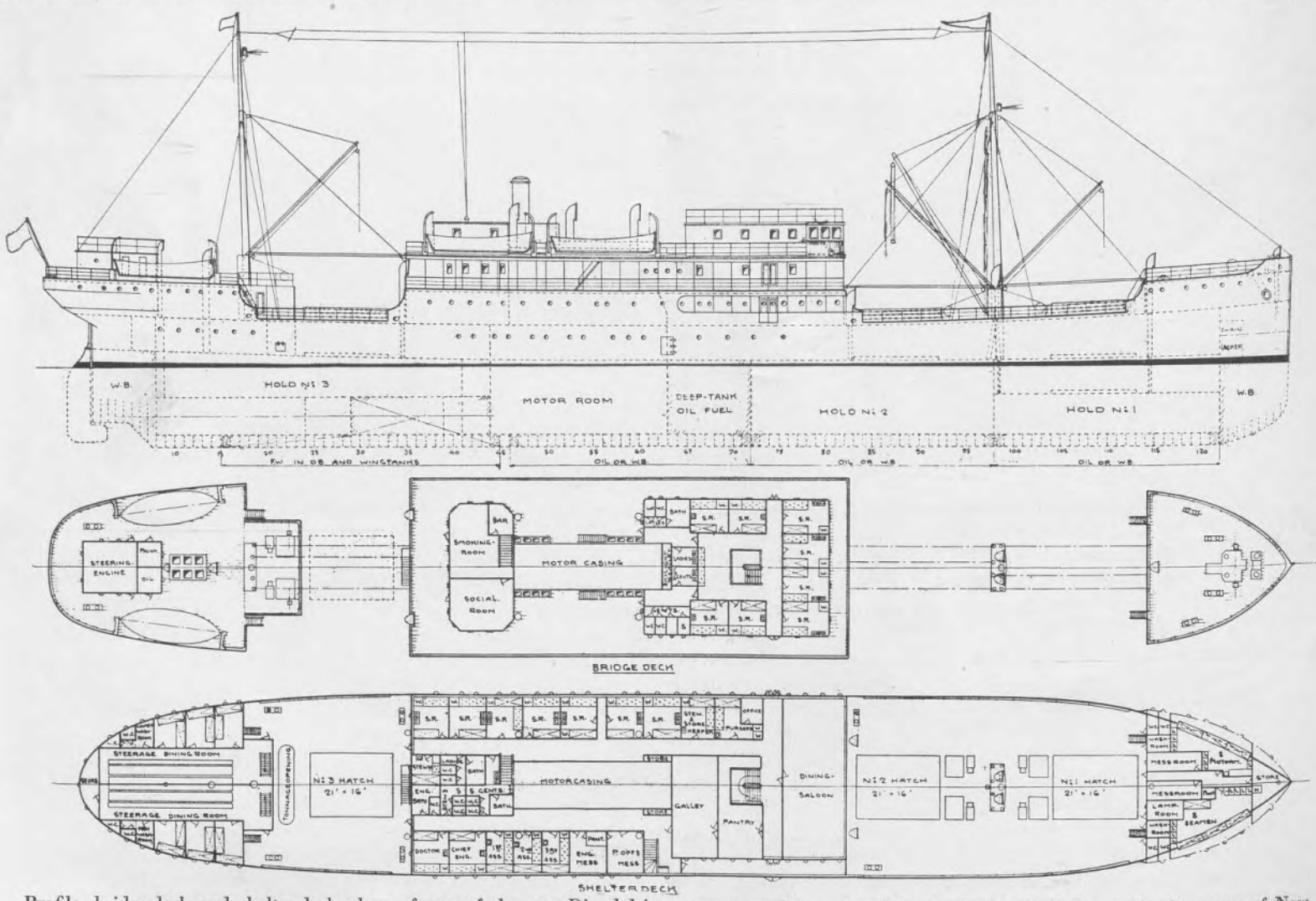


The new Götaverken-built cargo motorship "Kolsnaren" on her recent trial trip. She is propelled by Götaverken-Burmeister & Wain type Diesel engines. Trials were run on the same day as the launch of the motorship "Oxelosund" at the same yard

American Shipowner Orders Two Motor-Liners in Sweden

Götaverken, of Göteborg, Receive Order from Pacific Mail Steamship Co. for Two 3,000 Tons Passenger Motorships for Pacific Coast Service

JUDGING by the considerable number of orders for marine and stationary Diesel engines for motor-yachts and motorships placed in Europe by American owners during the last two months, the question of first cost of new craft and machinery is one of paramount importance at the present time. Labor, material and overhead costs have constantly been increasing in this country. As a result it has been practically impossible for manufacturers and shipbuilders to reduce their prices, while the tendency abroad has been towards lower labor, material and overhead charges. Many European shipyards have consequently been able to bid much lower prices on oil-engines, motorships, etc. This has made the situation particularly serious for



Profile, bridge-deck and shelter-deck plans of one of the two Diesel-driven passenger ships ordered by the Pacific Mail Steamship Company of New York from the Götaverken of Göteborg, Sweden. Crew's accommodation is on main deck not shown

American companies, especially where vessels will be operated by American owners under foreign flags and the protection afforded by the customs duty to American products does not come into consideration.

The latest order placed in Europe by an American company is a very important one, consisting of two 3,000 tons deadweight Diesel-driven passenger motorliners contracted for with the Götaverken, of Göteborg, Sweden, by the Pacific Mail Steamship Company, of New York & San Francisco, a subsidiary of W. R. Grace & Co. The latter company, by the way, owns a big block of stock in one of the largest American shipyards building marine Diesel-engines, and this makes the order specially significant. The two craft will be built as sister-ships and operated on the Seattle-Frisco-Valparaiso route under a foreign flag. Their dimensions are as follow:

Dead-weight capacity	3,000 tons
Length	300'0"
Breadth	45'7"
Moulded depth to m.d.	30'0"
Power	2,800 i.h.p.

In each ship twin 1,400 i.h.p. Götaverken—B. & W. Diesel-engines will be installed, as well as three auxiliary Diesel-engines of 100 b.p.h. connected to generators for operating the electrical auxiliaries.

The vessels will be fitted with very extensive ventilation, and large cold storage rooms. Altogether there will be 40 staterooms for first-class passengers, in addition to 4 *de luxe* cabins with private bathrooms. This accommodation is on the shelter deck and bridges, as are the smoking-room and lounge. There will be space for cargo. The first of the two motorships will be delivered in June, 1924, and the second in August of the same year.

View of part of the Göteborg Exposition showing Memorial Hall

Gothenburg International Exposition

Götaverken Is Exhibiting a 2,000 i.h.p. Diesel-type Marine Engine—Motorships to Be Discussed at Convention

MOTORSHIPS will have a prominent part in the exhibits of navigation and in the International Marine Congress to be held this summer in connection with the great Tercentenary Jubilee Exposition in Gothenburg, Sweden. The navigation exhibits may be seen all summer, the exposition continuing until September 30th. The International Marine Congress will be held during *the first week in August,* which will be "Navigation Week" at the Exposition. A number of conferences of shipbuilders, shipowners, and underwriters will take place during that week.

One of the leading subjects for discussion during that week will be the motorship and its future. In recent years Sweden has been taking to the motorship to a great extent. Since 1916, Götaverken, builders of ships and of Burmeister & Wain type Diesel motors at Gothenburg, Sweden, have turned out fourteen Diesel ships and fitted three vessels built at other yards with Götaverken Diesel motors. The size of these ships has ranged between 8,000 and 10,000 tons d.w., and the power between 2,800 and 4,000 i.h.p. Götaverken have the largest floating dry-dock in Scandinavia. This dock is soon to be increased by several thousand tons lifting power.

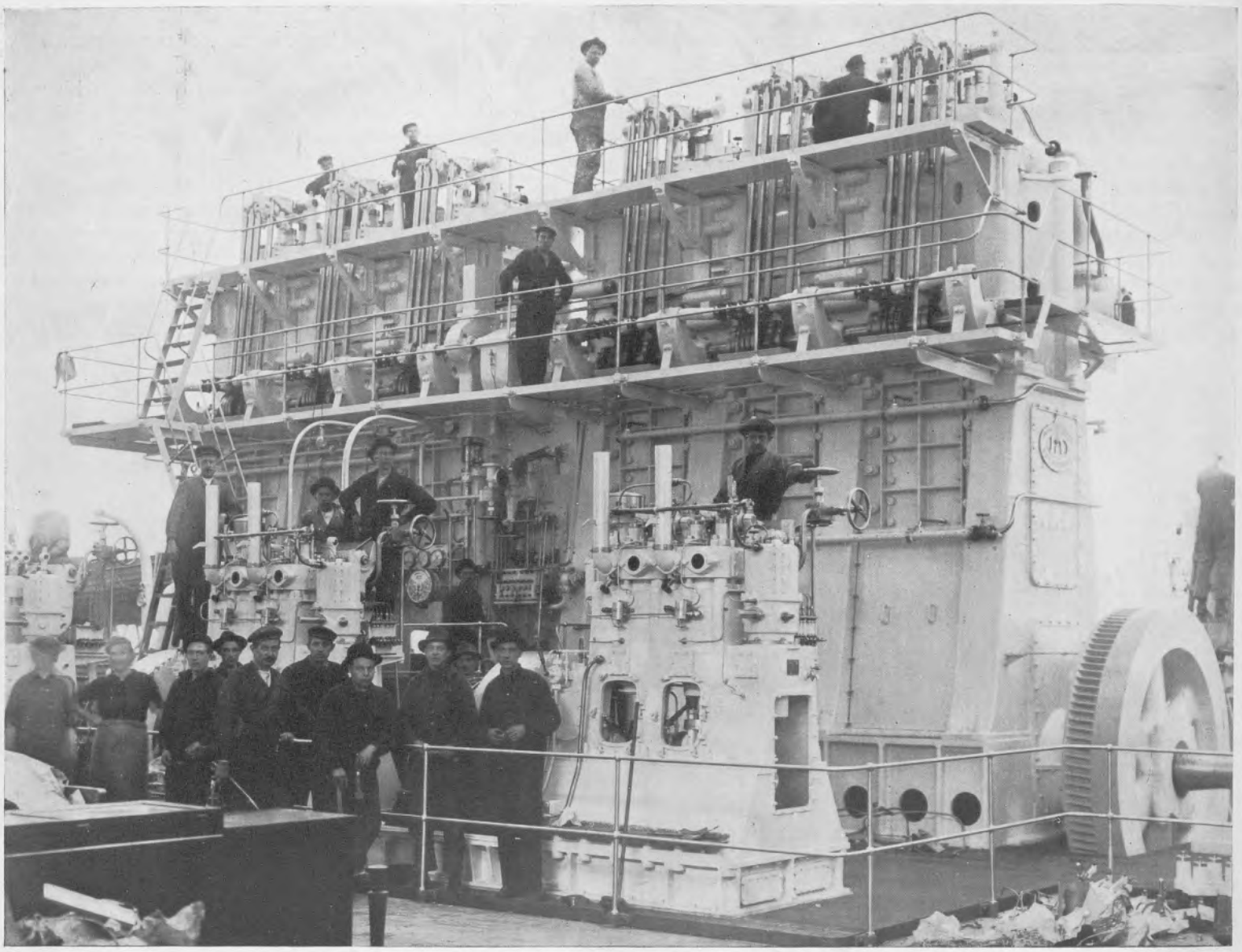
The Swedish-American Line, the first among the transatlantic steamship companies to place an order for a big motor passenger-liner, report that there are twelve motorships now operated under the same management as the Swedish-American, and these ships have given general satisfaction. They aggregate 110,500 d.w. tons, and the firm has 26,000 tons of Diesel power vessels now building.

The most important of these ships is the GRIPSHOLM, the new motor passenger-liner, which it is expected will be completed in the fall of next year, and put into the Swedish-American Line's passenger service between New York and Gothenburg. The ship, as previously reported, is being built at the Elswick Works, Newcastle-on-Tyne, by Armstrong, Whitworth & Co., and the propelling machinery is being constructed by Burmeister & Wain, Copenhagen. This machinery consists of twin six-cylinder Diesel-engines of the new double-acting four-cycle type, developing a total of 13,500 shaft h.p., which means an indicated horse power of 16,000. There are also six Diesel sets representing 3,315 b.h.p. for auxiliary purposes.

Gothenburg, the leading Swedish seaport, has spared no pains to make her navigation week of international importance. In connection with the Jubilee Exposition there is a special exhibit devoted to navigation and the history of navigation, where modern shipping may be seen in the perspective of its historical development. The exhibit includes the following divisions:

1. Shipping and shipbuilding, models of ships and shipyards. Diesel engines.
2. The science of navigation, nautical instruments, nautical literature, sea charts.
3. Life-saving and safety devices, life boats, modern ship construction for safety, methods of salvaging.
4. Lighthouses, light buoys, etc., from the earliest time to the present.
5. Fisheries, fishing vessels, tackle, methods of fishing, oil engines.
6. Canal shipping, canals and canal building.
7. Statistical exhibits.
8. Exhibits of the Swedish hydro-biological, and meteorological hydrographic commissions, oceanography.

This navigation exhibition will be one of the most complete ever put on, and will comprise ten large halls, exclusive of the fisheries exhibit. The first hall shows ship models from the Viking period up to 1718, including old Hanseatic ships and a model of the Kalmar Nyckel, the ship that brought the first Swedish colonists to America in 1637. Other halls show ship models carrying the history of shipbuilding forward to the present day. The largest



A big Götaverken-Burmeister & Wain Diesel marine engine and three auxiliary Diesel sets at the Göteborg Exposition, Sweden. This is the largest marine oil-engine ever shown at an international exposition

of the halls is the one devoted to motorships and steam navigation.

Captain Olof Traung, director of the Gothenburg Marine Museum, is in charge of the marine exhibits, and has given a great deal of time and thought to getting them up. In this he has had the able advice of Admiral Hägg, the grand old man of the Swedish navy, now retired. Admiral Hägg is the creator of the Stockholm Marine Museum, and is also a marine painter of distinction. Today, at the age of eighty-four, he has just turned out a series of historical paintings of ships of past times for the Gothenburg Exposition. These include merchantmen and warships from all ages.

In connection with the industrial side of this exhibition there is a very fine, selected display of all kind of oil-engines manufactured in Sweden. Included with these is a marine Diesel-engine of 2,000 i.h.p. built by the Götaverken, together with all the auxiliary machinery required in an engine-room of a vessel driven by such power. It is ordinarily impossible to take a photograph showing the position of the machinery in the engine-room as a whole, but as will be seen from the illustration of this motor with auxiliaries, as displayed at this exhibition, the exact position of each machine is represented as it would be when in place aboard the vessel. Those interested in this kind of machinery should not miss this chance of seeing the exhibit, because the machinery can be seen as it would be on board, but is free from cramped surroundings. This Diesel set has been constructed for a vessel now building at the Götaverken, and will be installed at the conclusion of the exhibition.

ON TRIAL YES—AT SEA NO!

Trial speeds of cargo vessels are misleading. Rarely does a steamship maintain its test speed in actual service, but a motorship often equals or betters the nautical-mile average after several months' service. If a single-screw steamer of 10,000 tons and 3,000 shaft h.p. at 75 r.p.m. and a twin-screw motorship of 3,000 shaft h.p. at 100 r.p.m. were to run trials simultaneously over the same course in smooth water the steamer probably would average the better speed. But, the motorship unquestionably would average ½ to 1 knot higher speed over a year's operation under ordinary conditions. The reason is simple. Freighters run partially loaded or light for at least 30% of their sea-going period, under which condition the twin-screw Diesel-powered ship with its smaller and more deeply immersed propellers has a much better propulsive efficiency, particularly as the revolutions are constant, and not fluctuating as in the case of the single-screw steamer with its big propeller nearly half clear of the water when in ballast. This extra knot means larger earning powers and smaller fuel-bills for the motorship owner.

FORESTRY DEPT. REJECTS BIDS

Regarding the 57 ft. cruiser for the Forestry Branch of the Department of Lands, Canada, referred to on page 435 of our June issue, all bids were rejected by the Department on account of being too high. It is possible that the Department may construct the boat at its repair plant at Thurston harbor, which at present is used for a fleet of motorboats used by the fire rangers. As stated, plans call for a 55 b.h.p. Washington-Estep oil-engine. It is understood that the award for the construction of two 60-foot Diesel engined fishery-vessels for the Department of Marine & Fisheries of the Dominion of Canada will be awarded to the Prince Rupert Drydock & Shipyard of Prince Rupert, B. C., whose bid, exclusive of oil-engines, comes to $23,590.00. The make of 55 b.h.p. oil-engines has not yet been announced. Previous reference to these two crafts was made in our June issue.

Business Yacht "Ripple" with Krupp Engines

Another Yachtsman Goes Abroad for the 600 h.p. Diesel Plant of His—New 133 Ft. Boat

ONE of the notable additions to the fleet of the New York Yacht Club during the coming season will be the Diesel yacht RIPPLE, now under construction from designs by, and under the supervision of, Cox & Stevens for Clifford N. Leonard. Although the RIPPLE will in all sense be a yacht, she has been especially designed for business trips to Central and South America where Mr. Leonard has large oil field interests.

The dimensions of the RIPPLE are:

Length overall	133'9"
Length on waterline	126'0"
Beam moulded	23'0"
Draft	9'0"

In arrangement and general appearance this new boat is a typical Cox & Stevens vessel, having a practically straight stem, elliptical stern with moderate overhang, a continuous and rather lively sheer, ample freeboard, and powerful sections with considerable flare forward. She will have a continuous steel deckhouse on the main deck, and on the boat deck there will be two deckhouses, the forward one being used as a pilot house and captain's quarters, the after house containing the wireless apparatus and quarters for the wireless operator. Amidships will be a stack, and two heavy pole masts will be stepped on which sail may be set for steadying purposes at sea.

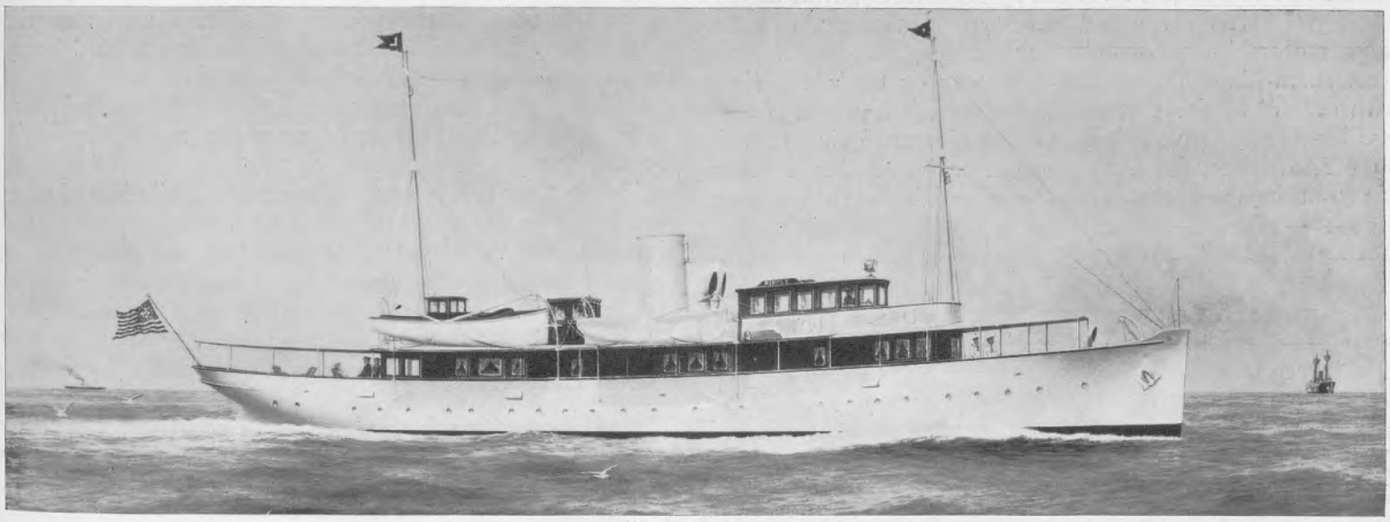
The machinery plant, which is located nearly amidships, consists of two 6-cylinder Diesel engines of the Krupp latest model, each of which will develop approximately 300 h.p., giving the RIPPLE a sea speed of at least twelve knots. Sufficient fuel is carried to give the boat a steaming radius in excess of six thousand miles, and water tanks and storerooms have been provided of ample size to meet the requirements of long voyages.

The staterooms for the owner and for his guests are all on the lower deck aft of the machinery space. The owner's own stateroom is at the forward end of this deck separated from the machinery space by an entrance hall containing a private stairway to the upper deck, with bathroom and large wardrobe, thus effectually shutting off all noise from the stateroom and permitting the owner absolute privacy, separating him completely from the staterooms occupied by his guests.

On the boat deck there will be carried a 23-ft. owner's launch, an 18-ft. crew's launch, together with a fishing launch and a life boat. For ease in handling these boats there has been provided an electric boat hoist and the windlass will also be operated by electricity.

Particular attention has been paid to the outfit of auxiliaries on the RIPPLE, and these include 2 Diesel electric generators of large capacity, all the necessary pumps and compressors for the operation of the engines, sanitary system, and other mechanical appliances, a forced ventilating system furnishing air for quarters, and a hot-water heating plant.

The RIPPLE is now well advanced in construction and will be seen in these waters for a short time only after she has been completed, as Mr. Leonard has in mind a visit of inspection at an early date to his properties in Central and South America.



Clifford N. Leonard's yacht, now building, and to have twin 300 shaft h.p. Krupp Diesel engines

EFFICIENT MIANUS-POWERED OYSTER BOAT

Since the Peconic Bay Oyster Co. of Greenport, N. Y., removed the 90 h.p. gasoline-engine from their oyster-boat PECONIC in April, 1922, they have had ample opportunity to note the efficiency of the 60 h.p. Mianus oil-engine which took its place. They have, furthermore, been able to realize the waste of money paid for fuel, as the new installation has only cost $800 for oil as against $4,000 for gasoline for the previous engine.

Such economy is noteworthy and it requires no far-sightedness to realize what a short life the gasoline-engine has in the work-boat field. The PECONIC is 65' long, 20' breadth and 6' draft, typical of the kind of vessel which enables us to enjoy that favorite shell-fish, the oyster. She brings to market 1,800 bushels each trip at better speed than with the previous engine. This is partly due to the fact that her engine drives a more efficient propeller, and the governor enables this to work to best advantage in rough water. Her consumption of lubricating-oil is about 10 per cent more than with the gasoline-engine, but only 30 gallons of 8-cent fuel-oil are consumed on a 10-hour run.

A rumor has reached us that Harland & Wolff are building two small motorships for the British India Steam Navigation Co.

Contract for a small Diesel-electric tank-barge has been placed by the Standard Oil Co. of N. J., with the Newport News Shipbuilding & Dry Dock Co., Newport News, Va. The make of machinery has not yet been decided. If this type of power is found by the owners to be successful in their service, larger Diesel-electric driven vessels will be ordered.

At the end of May, trials of the single-screw 8,000 tons motorship MEDON were carried out by her builders, Palmers Shipbuilding & Iron Co., Helburn-on-Tyne. The craft is owned by the Ocean Steamship Co. (Alfred Holt & Co., Liverpool), and is propelled by an eight-cylinder four-cycle Burmeister & Wain Diesel engine. A description was published some months ago in MOTORSHIP.

A speed of 13 knots was averaged on the recent trial of the 6,000 tons cargo motorship DALGOMA, built by Alexander Stephen & Son, Linthouse, Scotland, for the British India Steam Navigation Co. Her twin, Stephen-Sulzer two-cycle Diesel engines develop 3,200 i.h.p. at 85 r.p.m. These ran at as low a speed as 30 r.p.m. For auxiliaries there are two 410 b.h.p. Diesel-generator sets.

MOTORSHIP

Trade Mark, Registered

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STEAMSHIP DIRECTORS AND THE FUEL QUESTION IN HOLLAND

DUTCH engineers were the first to adapt Diesel power to ocean-going merchant-ship propulsion. Dutch shipowners—somewhat more conservative—were among the last to realize the commercial value to be derived from its use, and for years gave no sign of their knowledge of the success attained in this direction by engineering firms of their country. Partly through Lord Pirrie's influence, however, some motorships were built for the Holland-America and Rotterdam-Lloyd lines. After a year or two's experience with several of these economical vessels it looks as if these two big Netherlands shipping companies are going to make up for lost time, for both are now to be numbered among the enthusiastic advocates of oil-engine drive as demonstrated by the significant comments made by the Directors of the Rotterdam-Lloyd in the financial report for 1922 and by the remarks of Adrian Gips, managing-director of the Holland-America Line to a representative of the New York *Sun*. The following is an excerpt from the Rotterdam-Lloyd's report:

"During the past year the depression became more severe. The passenger trade was normal, but the amount of cargo offered was very unsatisfactory. Prices of coal remained practically at the same level, and the prices of fuel-oil are too high to enable the company to use oil on board the steamers fitted for burning coal and (or) liquid fuel.

"The motorship KEDOÉ *has run over 62,000 miles without a single mishap. Working expenses are considerably lower than for a steamer of the same carrying capacity. The directors have carefully considered the question of ship propulsion by internal-combustion engines, and they are convinced this question has been completely solved, both technically and commercially. The cost of building a motorship is higher than for a steamer, but working expenses are considerably lower, and it has been decided to place an order with the Royal Co. De Schelde, of Flushing, for a passenger motor ship, which will be named* WAJANG. *The propelling machinery of this ship will consist of a twin set of two-cycle Schelde-Sulzer Diesel engines of 3,500 shaft horse-power each. The dimensions of the hull will be the same as of the twin-screw turbine steamer* SLAMAT, *now building."*

American oil-companies should particularly note that while this Company found it uneconomical to burn oil under the boilers of their steamers, it was found very profitable to consume oil in Diesel engines, and to lay-down additional motorships at higher first-cost than steamships even when cargo is scarce and freight-rates low. This supports our contention that unless boiler-oil is sold at a price which leaves little or no profit to the oil-companies many shipowners will turn-over to (or continue using) coal. And, that by doing everything in their power to encourage motorship construction and perfection of boiler-oil burning Diesels the oil companies will be insuring their own future market.

Mr. Gips of the Holland-America company stated that cargo is moving in good volume in their particular service, and that the fleet of Diesel motorships placed in their trade have completely proved their capacity for economical and efficient operation. We might mention that these motorships are engaged in carrying American products from our Pacific coast to Europe, and when they were under construction the U. S. Shipping Board decided that the competition of these vessels need not be feared because their cost was too high.

SHIPPING BOARD AND NEW SHIP CONSTRUCTION

AT a recent meeting of the United States Shipping Board it was decided that the expenditure of $16,000,000 to recondition the passenger-liners AGAMEMNON and MOUNT VERNON was not warranted, as two new vessels of more modern design could be constructed for the North Atlantic service at a cost of $24,000,000. Consequently, the Board announced that it would ask Congress during the next session to appropriate this sum to construct two new ships of about 30,000 tons gross each. Seeing that the Shipping Board has been instructed by Congress to get out of the shipowning business as quickly as possible, it seems somewhat strange that the possibility of such an appropriation should even be considered, and it is to be expected Congress will give a direct refusal to the request if made.

With such a sum nearly one hundred steam freighters at present lying idle because of worthless machinery could be reconditioned and converted to profit-earning Diesel motorships, so there will be some horse sense if the Board asks for funds for this purpose to supplement the money it already has on hand. We do not suggest that the American Merchant Marine does not need these two proposed passenger liners. On the contrary, we believe such vessels should be built—but by private interests; although it would not be out of place for the Government to assist private owners in the construction of such vessels, and aid in their operation to the extent of offsetting the higher cost of construction and operation imposed by the higher standards of living of Americans compared with conditions in other countries.

SECRETARY DENBY CONFIRMS OUR OPINIONS

LAST month we pointed out the great importance of Congress appropriating funds for the construction of a fleet of large high-powered submarines, in which our Navy is sadly deficient. In a letter to MOTORSHIP Edwin Denby, Secretary of the U. S. Navy, says: "Your belief in the importance of Congress providing funds for submarine development and construction, during the coming session of Congress, is thoroughly concurred in by the Navy Department."

THE BOARD HAS AUTHORITY!

Mr. Lasker states that no further appropriation is neccessary for the Shipping Board to convert freighters to oil-engine propulsion if Congress will permit use of the Construction Loan Fund for this purpose. If the Board can legally re-condition the LEVIATHAN and other passenger vessels and fit turbine freighters with new machinery as it has already done, it is our opinion that it has authority to re-condition freighters to Diesel propulsion without consent of Congress.

Lasker Urges Conversion of Big Fleet of Steamers

Ex-Chairman of Shipping Board in Letter of Resignation to President Harding Calls for Immediate Adoption of Diesel Power for the 200 Reserve Vessels

IN his letter to President Harding announcing his retirement as Chairman of the Shipping Board, Albert D. Lasker discusses the work carried-out by the Board during the two years of his Chairmanship. At the end of the current fiscal year, according to this report, the Board will have on deposit in its Treasury $125,000,000. According to I. B. Smull, President of the Board's Emergency Fleet Corporation, about $50,000,000 will be available for the Construction Loan Fund.

Last month in MOTORSHIP, we indicated that the resignation of nearly all the Chairmen of the Shipping Board took place directly following the announcement of a Diesel motorship program, or recommendation for such. Evidently ex-Chairman Lasker is no exception to the rule, for in his final report to President Harding on June 11th he proposes that for highly competitive routes a given number of the reserve of 200 steamers of 1,750,000 tons deadweight be fitted with Diesel engines and placed in commission in the service of eighteen operating Companies recommended to be established under the Emergency Fleet Corporation. He points out that after exhaustive tests of the comparative operation of the highest class of vessels with oil-fired boilers and with Diesel-oil engines, the advantage is roughly twenty-five percent. in favor of motorships. If estimates are realized the result in saving through conversion will more than compensate for the disadvantage in physical operating cost under which our ships now labor.

Ex-Chairman Lasker Said to President Harding—

(*Extract from letter of June 11, 1923*)

—"An intensive study, based upon practical tests, of the cost of physical operation of the highest type of oil-burning ships with similar ships propelled by Diesel engines has demonstrated an advantage of roughly twenty-five per cent. in favor of the latter. It is my recommendation that from the steamships which I have characterized as a reserve, a given number be refitted with Diesel engines, and that these vessels be placed in commission in the service of the eighteen operating companies recommended to be established under the Emergency Fleet Corporation.

If the estimates of the economies which may be effected through the conversion of these vessels are realized, the resultant saving will more than compensate for the disadvantage in physical operating costs under which our ships now labor. Indeed, with the early completion of this program, supremacy in the economic physical operation of ocean freight carriers might well pass from foreign fleets to our own merchant marine, for the reason that we would then possess such superiority in Diesel tonnage that in spite of existing handicaps our carrying trade would be firmly established before our example could be followed by others.

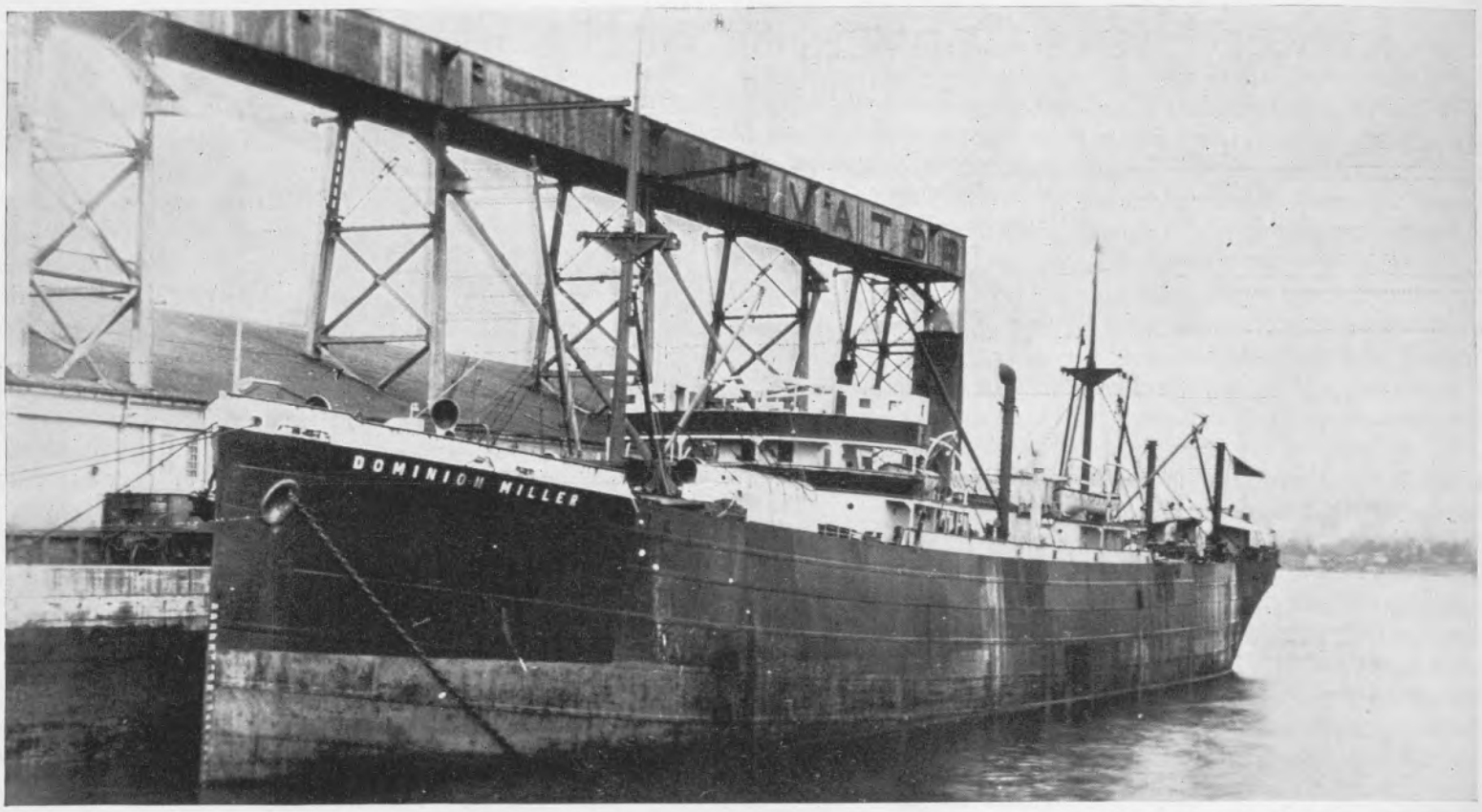
"No further appropriation will be necessary if Congress will permit the use for this purpose of the Board's Construction Loan Fund, the effect of which will be such economies in operation as to permit of the restoration of the capital within a relatively brief period."

No statement could be more important than this, as it is the continual cry of all American shipowners that the higher cost of construction and the higher cost of labor due to a higher standard of living in this country, place all American ships at a disadvantage with vessels under foreign flags. In other words, if all American ships were converted to Diesel power without a high overhead charge to the owner, there would be no necessity for a subsidy to offset the advantage now held by foreign craft. Mr. Lasker gives the cost of operating American vessels as being ten to fifteen percent. higher than for foreign craft.

Of statements on the importance of oil-engine-power made by several chairmen of the Board, including Wm. Denman and Edward M. Hurley, none seem to be more definite than the claim made by Mr. Lasker, who also points out that supremacy in the economic physical operation of ocean freight-carriers will pass from foreign fleets to our own merchant marine, for the reason that we should then possess such superiority in Diesel tonnage.

It is very unfortunate that Mr. Lasker did not realize this when he undertook the Chairmanship two years ago; for the Board had in its archives enough information to uphold every statement now made. Also ample figures and proof have been available in our pages. If Mr. Lasker had had sufficient foresight and courage to have actually carried out a big motorship conversion program, his name would have gone down in history as the man who made the wartime American merchant fleet a commercial success, whereas Mr. Lasker accompanies his plea for a Diesel fleet with his resignation. He says that no further appropriation will be necessary for the conversion work if Congress will permit the use for this purpose of the Board's Construction Loan Fund: by which we presume Mr. Lasker is endeavoring to ensure that his successor will not "pass the buck" to shipowners and get them to render practical the worthless and inefficient vessels constructed by the Government. Mr. Lasker has let pass by one of the greatest opportunities ever a man had if his own words are a criterion.

He showed the tremendous importance of this problem by stating there are between nine hundred and one thousand ships for which at present they have no employment, and the existence of which acts as a depressant on the merchant-marine of the world—most of all on our own. Evidently Mr. Lasker has taken our recent article, "Scrap One Thousand Ships," to heart as he also recommends that the Board be authorized to scrap all ships which cannot be sold.



Furness-Withy Company's Doxford-built single-screw motorship "Dominion Miller," loading at Vancouver, B. C.

Sending Their Finest Ships

Motorship "Dominion Miller," Recently Placed on the Pacific Run, Is Successfully Using 18 Degree Beaumé Boiler-Oil

UNDER the head "Sending Their Best Vessels" the Vancouver Daily Province on May 18th says: "Proof of the confidence of British and other large shipping nations in the future of Vancouver, it is pointed out, is seen in the class of vessels that are being sent here. The latest types are to be devoted to Vancouver. The Royal Mail Steam Packet Co. pioneered in this. They placed their finest new motorships on the run. The Holland-America did likewise. The motorships of the East Asiatic and Johnson line are regular servants. The Canadian-Australian Royal Mail Line built a splendid motorship, the HAURAKI, and gave her to the Vancouver service. She has been on the run for more than a year. This same company is building a new and magnificent motorship for passenger work out of Vancouver that will be as large as the EMPRESS OF AUSTRALIA. Now the Furness Withy Co. has announced that in future the coal- and oil-burning freighters which they have been using will be superseded by motorships.

"A new motorship on the run is the Furness-Withy freighter DOMINION MILLER, one of the latest types of British-built deep-sea carriers with internal combustion engines. The significance of the steady addition of motorships to Vancouver by regular line is in itself a very convincing proof of recognition by the transportation companies."

The Furness-Withy freighter DOMINION MILLER, Capt. G. W. A. Newman, particulars of which appeared in MOTORSHIP following her first voyage across the Atlantic in 1922, has now covered over 45,000 miles. She is of 9,600 tons deadweight capacity, equipped with a Doxford opposed-piston two-cycle Diesel engine of 2,610 s.h.p., in a 4-cylinder unit driving a single propeller. The Furness-Withy Co. have been testing-out this type of engine in this vessel, preparatory to embarking on an ambitious Diesel program—probably with the Richardsons, Westgarth plant which recently purchased a Doxford license. The first of these new vessels is expected to be ready in the Fall, and will be a 14-knot motorship of 10,000 tons deadweight capacity, equipped with a three-cylinder engine, developing 4,400 s.h.p., driving a single propeller. This engine will also be of the Doxford opposed-piston type with such improvements as experience has suggested.

After the regular service tests to which the engines of the DOMINION MILLER have been subjected it is interesting to hear from her chief engineer, W. Coller, that after arriving at Vancouver, British Columbia, from United Kingdom and Continental ports, via the Panama Canal, on which trip there were 34 days actual running time, the crank chambers were clean and no repairs of any description on account of defective parts had to be made. From Antwerp to San Francisco the DOMINION MILLER averaged 10½ knots on a fuel consumption of 7½ tons per day. There was no time lost, no anxiety and no stoppages.

The engines have a range of 16 to 75 revolutions per minute, and Mr. Coller stated that on her last trip up the Thames she ran for 5 hours at 19 r.p.m. while waiting for the tide. He also states that she reverses very promptly: four to seven seconds from full-speed ahead to full astern.

There is an eight-ton traveling crane in the engine room by which all the pistons can be removed and laid out in position for liner or other inspection in one day.

At present all the auxiliary machinery, including compressors, pumps and deck

SPECIFICATION OF MOTORSHIP DOMINION MILLER

Name of owner	Furness Withy Co., Ltd.
Name of builder,	Wm. Doxford & Sons., Ltd., of Sunderland
Name of engine builder,	Wm. Doxford & Sons, Ltd., of Sunderland.
Class & Society	100+A1 Lloyds
Length o.a.	435′
Length b.p.	430′
Breadth extreme	54′
Depth moulded	29′
Loaded draft	26′
Gross tonnage	5,200 tons
Net tonnage	3,400 tons
Loaded displacement	12,750 tons
Deadweight capacity	9,600 tons
Weight capacity of deep tank	2,000 tons
Fuel tanks (double bottom)	1,200 tons
Fresh water	100 tons
Cruising radius	24,000 miles
Shaft h.p.	2,610
Indicated h.p.	3,100
Engine speed	75 r.p.m.
Trial speed	12.25 knots
Loaded speed	11.5 knots
Propeller diameter	16 feet 5 inches
Propeller pitch	17 feet 6 inches
Propeller area	75 square feet
Daily fuel consumption of main engines at 11.5 knots	9 tons
Daily lubricating oil consumption, all told	14 gals
Number of engine and boiler staff	11
Type of engine	Doxfords Opposed Piston, Two-Cycle
Cylinder bore	22¾ inches
Cylinder stroke	45½ inches for each piston
Weight of main engines	350 tons (about)
Length of engine space	45 feet
Date put in service	February, 1922
Type of deck machinery,	steam (proposed changing to electric)

winches, is driven with steam supplied by two Cochrane oil-fired boilers located in the main engine room. This feature we previously criticized. However, *we understand that after this trip it is proposed to install electric winches, etc.*

A special feature of this trip was the use of boiler-oil for the main engines, a higher grade of fuel having been previously used except for occasional runs. The Chief Engineer states that they are now burning heavy boiler-oil exclusively, for maneuvering as well as for steady running at sea. This oil is 18 deg. Beaumé, specific gravity of 0.947. Airless-injection of this fuel with low pressure of 3,000 pounds to the square inch has been adopted, as against the 7,000 to 10,000 lbs, previously used. The oil is heated and injected at a temperature of 130 degrees Fahrenheit, while in the feed tank it is kept sufficiently warmed to flow freely through the pipes. There is perfect combustion of the heavy oil. No trouble has been experienced with either sulphur or asphalt contents in the Diesel engine. The lubricating oil is periodically passed through a centrifugal separator to remove impurities.

The reliability of four-cycle type Diesel engines on the long run from European ports to the west coast of North America has been well established. The development of the two-cycle principle is apparently proving equally satisfactory; for, besides the plans of the Furness-Withy Co. to go ahead with engines of this type, the Union S. S. Co., which has a 22,000-ton passenger liner on order for the Canadian-Australian run, is having engines of the Sulzer two-cycle type; and 30 percent of more of the large Diesel driven motorships on order will have two-cycle engines.

Furness, Withy & Co., one of the most progressive and best managed of the British steamship lines, were one of the first shipping companies to take up the marine Diesel-engine. It is a tribute to their broadmindedness and courage that they were undaunted by the practical failure of the experiment they made in 1913 with the motorship EAVESTONE. They realized that the fault lay not with the oil-engine as a type, but with the particular design they had selected.

The EAVESTONE's engine—she was a single-screw vessel—was built by Richardsons, Westgarth, one of the Furness-Withy subsidiaries. The experience gained from her operation led them to abandon the two-cycle design they had taken over from one of the Continental builders. Their next step was to take up a license of the Beardmore-Tosi four-cycle type, and now they have renewed their association with the two-cycle type by the acquisition of a Doxford license. How thoroughly Richardson-Westgarth are going into this development appears plainly from the announcement that half a million dollars has been appropriated in connection with it.

The Furness-Withy fleet includes several motorships today, but they are only the nucleus of a big motorship list planned by the company. A line of this caliber, with vessels on every sea, aiming to get business in good times and bad by the service and rates they give their customers, never stands still. To such a house the motorship is a live improvement.

G. B. WARREN.

SOME RECENT FRISCO STANDARD OIL ENGINE INSTALLATIONS

Reports of satisfactory service of a 55 b.h.p. engine installed in the fishing-boat YOKUMA some weeks ago have been drifting back from the Coast Fishing Co., owners, to the engine builders, the Standard Gas Engine Company of Oakland. The YOKUMA is of the tuna-fishing type, 53 feet 2 inches length at the waterline, 12 feet 6 inches breadth, and having a depth of 5 feet 6 inches. The new engine, which is a three-cylinder two-cycle surface-ignition unit, operates a 44-inch wheel at 360 revolutions per minute, and drives the boat at 11 knots.

The engine is equipped with a circulating water pump, circulating-oil pump with filter, a compressor and a gear-driven centrifugal pump, which may be used either as an auxiliary circulating or a bilge pump. This pump is clutch-connected. The engine can be reversed easily by means of a sliding sleeve with two sets of air-starting cams, or, for short periods of going astern, maneuvering, etc., when loss of power through gears is not serious, the propeller can be reversed through a clutch and gear. Except for starting, the engine is controlled from the pilot house.

For an auxiliary there is a five-horsepower vertical one-cylinder gas engine, direct connected to a Rix compressor.

Two 100-horsepower Frisco-Standard Oil engines have been shipped to New Orleans, where they recently were sold through an agent to parties unknown to the builders, and a third of like size is being built for the same agent.

No less than eight Frisco-Standard oil-engines are being installed, or have just been installed, in workboats operated in or around Seattle. They are a 100-horsepower four-cylinder engine being put into the SEYMOUR, a like engine going into the EQUATOR, a 75-horsepower three-cylinder engine put into the BROADWAY (installed at Astoria); a two-cylinder 35-horsepower unit into the LIPPSETT (a Vancouver boat, but installation at Seattle) and 110-horsepower three-cylinder engines put into the POLARIS, VANSEE and LIBERTY.

A 55-horsepower three-cylinder oil engine has just been shipped by the Frisco-Standard people to Jacksonville, Fla., and a 40-horsepower two-cylinder oil-engine has been dispatched by them to New Zealand.

Three three-cylinder Frisco-Standard oil-engines recently were sold to fishing interests at Gloucester, presumably for installation in fishing schooners. The units were of 55 horsepower.

ANNUAL FINANCIAL REPORT OF WERKSPOOR

Werkspoor, the Diesel-engine building company of Amsterdam, has just issued its annual report for the year 1922. This showed profits in the course of the twelve months to have been 654,310 guilders, compared with 948,964 guilders in 1921. In the course of the year, two complete Diesel-engine installations were delivered for the motorships RHEA and HALLFRIED. In common with many other engineering firms in Europe, Werkspoor suffered from lack of orders during the period under review. The report states that owing to the great competition encountered from Dutch and foreign builders, orders have to be taken at prices which are really below cost. It will therefore be necessary for cost of production to be reduced, and the question has to be answered whether the existing equipment of the factory enables this to be done. The resources of the firm, owing to conservative management in the past, have permitted, the report continues, a sum of 1,000,000 guilders to be donated this year to the establishment of an Employees' Pension Fund. Work in hand at the present time includes eight marine installations, in addition to sugar machinery, locomotive and other equipment which the company builds. A dividend of six percent has been paid on class A stock in place of the eight percent paid last year, and a dividend of five percent on the class B stock in place of six percent paid in 1921. Total assets are nearly 30,000,000 guilders.

MOTORSHIP "CLELIA C," ex "CHRISTIAN X"

The FRATELLI BANDIERA, ex-CHRISTIAN X has been renamed CLELIA by T. Camparella of Genoa, her new owner. This vessel was the second Burmeister & Wain motorship built for the East Asiatic Company. She was christened FIONIA, but the only voyage she made under that name was from Copenhagen to Kiel, where she was purchased by Albert Ballin for the Hamburg American Line which rechristened her CHRISTIAN X. Ballin was at that time a guest of the Kaiser aboard the Imperial yacht HOHENZOLLERN, and this explains how the German Emperor had the opportunity, in connection with this ship, to send out one of those wonderful telegrams with which he used to enliven Europe. Out went a message to the King of Denmark, congratulating him upon Danish preëminence in the field of oil-engine development and paying tribute to the wonderful new invention! Do you remember the howl that went up from German engineers when they were so augustly told that the Diesel engine as a new Danish invention? Her original owners replaced her with another FIONIA.

F. Mortimer Singer's 312 gross tons auxiliary barque-rigged yacht MODWENA has been converted to a schooner-rigged pleasure fishing vessel. Her owner is B. Davidson of Natal, S. A. The old 200 b.h.p. Gardner kerosene motor has been replaced with a 225 b.h.p. Densil oil-engine Day accommodation is provided for 150 passengers.

A. S. Hebble and European Oil-Engine Construction

Following a visit to the leading American Diesel-engine building plants A. S. Hebble, Superintendent-Engineer of the Southern Pacific Steamship Line, made a trip to Europe visiting the following firms engaged in oil-engine and motorship construction:

William Doxford & Sons, Sunderland, England.

Cammell Laird & Co., Birkenhead, England.

Vickers, Ltd., Barrow-in-Furness, England.

North Eastern Marine Engr. Co., Ltd., Wallsend-on-Tyne, England.

Hawthorne-Leslie & Co., Newcastle-on-Tyne, England.

Armstrong-Whitworth & Co., Newcastle-on-Tyne, England.

North British Diesel Engine Co., Glasgow, Scotland.

Wm. Beardmore & Co., Glasgow, Scotland.

Scotts Shipbuilding Co., Greenock, Scotland.

Fairfield Shipbldg. & Engineering Co., Govan, Scotland.

Swan, Hunter & Wigham Richardson, Wallsend-on-Tyne, England.

Alexander Stephen & Sons, Ltd., Govan, Scotland.

Werkspoor, Amsterdam, Holland.

Burmeister & Wain, Copenhagen, Denmark.

Krupp Company, Kiel, Germany.

Franco Tosi Co., Legnano, Italy.

Ansaldo-San Giorgio, Turin and Genoa, Italy.

Schneider et Cie., Paris, France.

A few weeks ago Mr. Hebble outlined his experiences at a luncheon at the Propeller Club, New York. At all the above shipyards and repair plants Mr. Hebble found only two motorships undergoing repairs. During his visit, he stated, he had learned a great many things about the Diesel engine he had not known before. The Diesel engine is not such a complicated affair as some of us would believe and we should have very little difficulty in securing efficient operating engineers.

A significant indication of the trend of ship construction in Europe is that one of the greatest shipping executives has recommended that his company shall not build any more steamships. The Diesel engine is no longer an experiment and is reliable and efficient under proper management.

Incidentally, while the four-cycle design is in the strongest position today, it must not be taken as evidence that it is the best. According to Lloyds Register, continued Mr. Hebble, there are now in operation 158 large Diesel motorships aggregating 876,000 tons, while on order, according to a British authority, there are 107 Diesel-driven vessels aggregating 890,000 tons.

Dealing with the technical side of the oil-engine problem Mr. Hebble discussed the question of cylinder design, cooling, lubrication, and the question of fuel-oil, as well as the four-cycle, double-acting engine.

According to Mr. Hebble, the problem of fuel is very important owing to the very heavy Mexican oils such as 14 degree Beaumé producing excessive piston, piston-ring and cylinder-liner wear due to the ash content of this oil, and that after one to two years' operation there is a falling off in efficiency due to the lack of compression caused by slack pistons and worn liners. This means that there are certain delays for cleaning the pistons and rings and changing of new liners, etc.

Of all the oil-engine builders Mr. Hebble saw in Europe there was none who would honestly say that he could use the heavy Mexican oil with the same degree of satisfaction as is consistent with the Diesel oil.

This had considerable effect on his own action because his company controls its own fuel supply, which is a very heavy low grade Mexican. Consequently, if it went into Diesel propulsion he figured it would have to go into the open market and buy the lighter oil at a figure which would be much higher than the cost of production of the oil used in its present steamers. This difference in cost would detract very considerably from the economy due to the lower consumption of the Diesel engine. But, at the same time he pointed out that Diesel engines, particularly the double-acting type, would take up less fore and aft space and consequently increase the cargo capacity.

Cleaning Heavy Oil

In this connection we would point out that there is growing hope that heavy Mexican oils can now be treated and the ash producing material and sulphur taken out by centrifugal separators such as are now manufactured by the De Laval Separator Company and the Sharples Specialty Company. The cost of maintaining and operating such a machine is very low, as it is a single purifier driven by a small electric motor and can handle all the fuel burned in a day by the largest motorship. Already most motorships have one of these purifiers for cleaning their lubricating oil, for which work they have been very satisfactory. We believe this subject is a very interesting one at the present time, particularly as Mr. Hebble stated that if it could use the Mexican crude-oil in Diesel engines with satisfaction his company would never build another steamer.

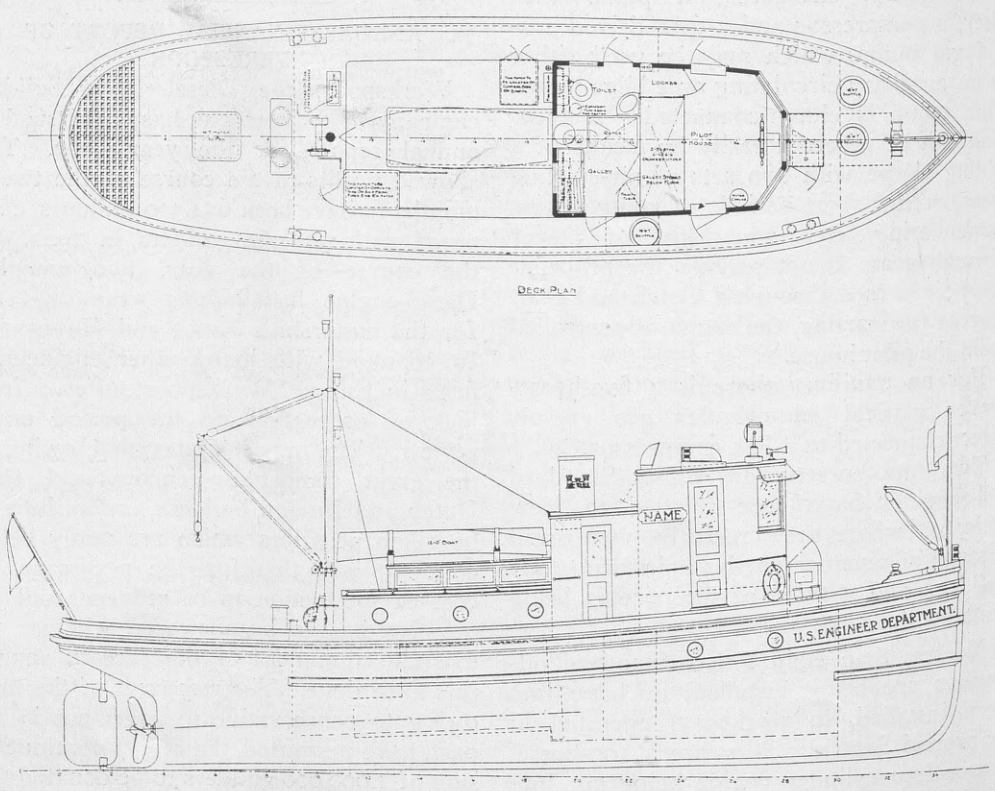
FOUR OIL-ENGINED TUGS FOR U. S. WAR DEPARTMENT

The U. S. Engineers Office of the War Department at Philadelphia arranged to open on June 22nd bids on the construction, testing and delivery of one to four 50′ steel motor tugs—two of which are for Philadelphia, Pa., the third for Kewanee, Wis., the fourth for Chicago, Ill. In each of these vessels a two or four-cycle heavy-duty marine type 80 b.h.p. oil-engine, capable of operating on kerosene and on fuel-oils of not less than 24 degrees Beaumé are to be installed. The tugs are of the following dimensions:

Length over all	53′ 3″
Length (b,p.)	50′ 0″
Breadth (o.a.)	14′ 1½″
Depth, moulded	7′ 3″
Draft, forward (approx.)	4′ 0″
Draft, aft (approx.)	5′ 0″
Displacement (approx.)	41 tons

On one tug a Kitchen reversing rudder with pilot house control is to be installed.

The successful bidder will be required to deliver one tug in 150 days and the fourth tug in 195 days, following the date fixed for commencement. Only engines of American manufacture will be considered.



One of four 50′ oil-engined tugs to be built by the U. S. Engineers Dept., Phila., of the War Dept. One boat will be equipped with a Kitchen reversing rudder

The Bethlehem "Baby" Diesel

Reasoned Conclusions About the Extravagant Claims Made

DURING the past month a series of interviews with J. J. Tynan, Pacific Coast manager of the Bethlehem Shipbuilding Corporation, has appeared in the daily press of the country announcing completion at their San Francisco plant of exhaustive tests of a new type of Diesel engine which they are now prepared to build in sizes from 5 h.p. to 100 h.p. Some of the claims which have excited extraordinary attention are: Lowest initial cost; lowest upkeep, due to fewer parts; lightness of weight; an engine which reverses itself; compression of 250 lbs., with combustion of fuel as perfect as in larger type Diesels; an unbelievably low cost of operation.

As the successful development of such an engine would be of paramount interest to our readers, steps were immediately undertaken by the publisher of this journal to secure the facts for publication. The conclusions we have reached, with the assistance of competent engineering talent, are that: the engine does not represent any radical departure from present day practice, the designer has brought forth nothing new, but a present tendency has been followed, granting the possibility of further improvements.

The standardized Diesel is in no danger of being relegated to the scrap heap, due to its so-called complications and high-pressures, and replaced by the Bethlehem engine. A high-grade hot-bulb engine is just as good in fuel economy and exhaust condition.

There is a considerable amount of experimentation to be performed in the development of the new sizes. Operating tests of the single-cylinder engine in their shop have not verified the claims made, and so far as we have been able to ascertain no tests have been made under service conditions.

There does not appear to be anything to justify the claims that this engine is "the industrial achievement of the age," or that "not millions, but actually billions of dollars will be involved through the development of this engine."

Over-enthusiasm of inventors is not uncommon. It is unusual, however, that the manager of a concern of such standing should give the public the impression that it had completed development of an engine of a new and revolutionary type when the facts seem to show that its experiments have been of limited character without verification or acceptance of accredited authorities on the internal combustion engine.

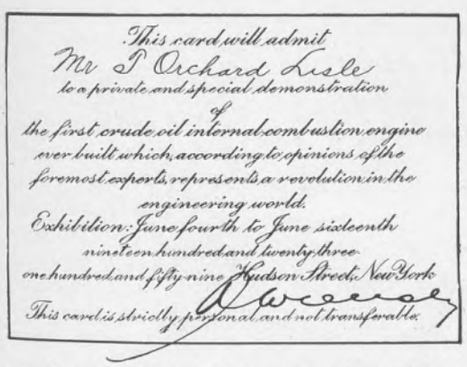
Our objective in frank discussion of the matter is to prevent confusion and uncertainty in the minds of our readers who would naturally look to this company to put this new engine on the market at once. Even after extended tests manufacture of such an internal combustion engine requires many months of preparation. Of course the Bethlehem Company has the capital and can command the engineering ability to produce an engine. We predict that if and when it does the engine will not be a radical departure from present standard practice.

There is no connection between the Bethlehem-Tynan engine and the large Diesel engine now completing tests in the home plant at Bethlehem, Pa. In fact Bethlehem engineering experts who have worked on oil engine problems for years do not seem to have been consulted about the Bethlehem-Tynan engine before the press announcement.

"REVOLUTIONARY OIL ENGINE" ALSO APPEARS IN THE EAST

Invitations were issued last month to a demonstration of a German designed oil-engine which was set up in New York, and operated for a time under conditions that did not permit the claims of the inventors to be checked.

The newspaper notices were of a startling character, many of them very extravagantly worded and calculated to convey the impression to laymen that an engine of remarkable superiority had been developed.


This card will admit
Mr P Orchard Lisle
to a private and special demonstration
of
the first crude oil internal combustion engine
ever built which, according to opinions of the
foremost experts, represents a revolution in the
engineering world.
Exhibition: June fourth to June sixteenth
nineteen hundred and twenty three
one hundred and fifty nine Hudson Street, New York
This card is strictly personal and not transferable

We found nothing to justify such comment when we attended a demonstration of the engine, nor did we find that the inventor himself was airing the views attributed to him.

As will be seen from the adjoining cut of the invitation card we received, Mr. Wielich, who appeared to be in charge of the New York demonstration, is not very modest in his claims. Yet this invitation card, like many others that were issued, was sent out by the National Association of Boat & Engine Manufacturers. In our judgment it was a grievous mistake for such a trade body to have sponsored a demonstration of this sort, unless it is willing to make good its omission to substantiate that this engine is "a revolution in the engineering world." We shall be glad to publish any facts and unassailable data which the National Association of Boat & Engine Manufacturers will send us in this connection. The engine is reminiscent of the Leissner type, but is said to operate with 200 lbs. compression and 350 lbs. maximum pressure.

The Mexican Government imposed a duty of $4.40 ($2.20 U. S. currency) on the Falk Supplement mailed with our May issue, writes one of our subscribers in that country.

In the U. S. Government Fisheries Department's vessel KITTIWAKE a 60 b.h.p. Union Diesel engine is being installed. The work has been carried out at the plant of the Lake Union Dry Dock & Machine Works of Seattle.

Two 150 b.h.p. Union oil-engines are being installed in two boats owned by the Wilmington Transportation Co., Los Angeles. One is the tow-boat LISTO and the other the tug VIVO, both at William Muller's yard, San Pedro.

In the tug STARLIGHT now equipped with a distillate engine, an 80 h.p. Union oil-engine is being installed. Her owners are Rhodes-Jamieson & Company, of Oakland, Calif., who will operate the boat on San Francisco Bay and tributary waters.

Krupps of Kiel are building twelve Diesel-driven tankers equipped with four-cycle and two-cycle Diesel engines.

ALMA, a motor-tug with a 200 h.p. surface-ignition oil-engine, has recently been built for the White Rock Tug Co., of Bellingham, Wash.

URANO, the Reichsausschuss furu Schiffsbau's (German Govt. Ship Construction Dept.) first motor-tanker, ran trials during May. She is of 8,000 tons d.w., 397' length, 54' breadth and 30' depth. Twin 950 shaft h.p. Deutsche Werke (who also built the hull), Diesel engines are fitted. Speed, 10 knots.

INDRA, a new Werkspoor Diesel-engined freighter, 9,678 tons deadweight, recently ran trials and was accepted by her owners, Winge & Co., Kristiana, Norway. Her twin-engines each develop 1,400 i.h.p. and a speed of over 11 knots was attained. Her hull was built by the Netherlands Shipbuilding Co., Amsterdam.

Shop tests have been made of a 2,500 shaft h.p. Beardmore-Tosi Diesel engine at the West Hartlepool plant of Richardsons, Westgarth & Co., who constructed the same under license. It will be installed in a cargo motorship of 9,200 tons d.w. now building at the Furness Shipbuilding Co.'s, Haverton Hall Plant for Furness Withy & Co. A sister hull is also building and will take a duplicate Diesel engine now nearing completion. Special tests will be made under the supervision of the Institution of Naval Architects, the Institution of Mechanical Engineers and the Institution of Marine Engineers.

From a Motorship Engineer's Viewpoint

How a Diesel-driven Vessel Suddenly Encountered a Series of Troubles After Three Years' Successful Operation

WITHOUT a doubt we all make mistakes but we do not always profit by them. Some do more than others. In telling this story I am obliged to mention the mistakes made by certain men and those who read can judge whether I committed errors also. I have to draw upon my memory, because I do not have the letters and log books to form documentary evidence of the assertions about to follow. Those papers were all left in the files of the motorship on which I served as chief-engineer for nearly three years. Because my case is the opinion of a single observer it may be somewhat biased.

The Ship and Its Conversion

It would appear to me that the motorship was built originally for two reasons; the first was a dire need of a ship during the war-time expansion of shipping, and the second was to learn what result could be expected with a motor-vessel as compared to a steamship. She was a war-time built tanker with three sets of surface-ignition engines of too low power installed in a small compartment aft. Consequently, the original installation did not prove entirely satisfactory to the present owners after they purchased it, so two American four-cycle Diesel motors were later fitted. There is no doubt the present engine-room installation is not satisfactory. Because of this the engines are considered at fault, whereas they are excellent and serviceable power units. They are of the trunk-piston, six-cylinder type. The auxiliary machinery is steam-driven. Many delays were due to the latter.

What the Owners Complained About

The great complaint about the ship is her cost of repair and long delay in port. It must be borne in mind that the cost of repairs on this ship as a whole were due to accidents to the fuel tanks and the continuous trouble with the steam auxiliaries.

The repair bills might be borne, but the delay wrecks the owners' schedule.

If delay is of primary importance, then we should make a comparison with other motor-vessels and see how she shows up. There being only cargo vessels of a similar size and power in service, and she being a tanker, there is nothing for comparison. Her mileage was greater, her turnarounds quicker than most dry-cargo vessels, yet that is not good enough for a tanker.

The Chief's Opinion About the Engine Room

Overhauling and repairs took far more time than was necessary or desirable. Being a tanker, this ship should have been provided with means of doing the routine work on the motors in the least possible time and with the least possible expenditure of labor. At any rate there should be no other type of vessel with better equipment for this work. Compare her with the William Penn, on which when an exhaust valve is lifted, a trolley carries it to the workshop for regrinding and carries a spare back to be lowered into the cylinder head. A cylinder head may be picked-up with the same track, trolley and tackle and carried away clear of the next step toward removing a piston. On the tanker in question such conveniences were impossible due to the awkward installation, the cylinder-heads being so close to the deck that it was necessary first to strip a cylinder-head down, then rig a tackle close to the deck with the lower hook snug against the head to get sufficient room to clear the studs. To move the head, it was necessary to set beam clamps next the deck and haul the head up between two tackles, lifting it in a bight.

Exhaust valves, fuel and air valves were all lifted with a tackle, then swung by hand clear of the heads and carried away between two men. This condition could not be remedied without tearing out a deck, moving two boilers and the galley. Her owners could not see the wisdom of making such an expensive alteration. Without exaggeration the William Penn can do her routine work in one-third the time, and with less labor expenditure, notwithstanding the greater bulk of machinery.

My statement that the tanker has an impossible installation, I am sure, will be borne out by the engine-builder, if not by the owners themselves, who purchased her after the war.

I feel that the owners did not fully appreciate the importance of a suitable installation when they literally crammed the motors into their ship, and I also feel that they allowed the first cost to outweigh the value of convenience which plays such an important part in saving delay.

Under normal conditions, with sufficient steady men in the crew, by applying systematic methods of doing our work we were enabled to get through the routine work in a reasonable length of time.

What Leaking Bunkers Mean

Leaky fuel bunkers allowing sea-water to enter caused more trouble on this ship than any one other condition. Our first experience with it did great damage to the Diesel motors, because we did not know just what the trouble was. However, one dose of salt water which extended over two Transatlantic voyages and a trip to the Gulf was not enough to damage the new engines to the extent of rendering them unserviceable. As a matter of fact, three doses have not ruined the motors, which will still give many years of service if properly handled and without a great outlay to place them in condition.

An article recently published in Motorship fully outlined what could be expected in the event of a bunker leaking. It is therefore needless for me to deal with that subject here, except to explain that other detrimental effects became manifest as the result of repetitions of the first disastrous experience. These showed themselves in the form of cracked cylinder-heads.

When an engine functions normally, the exhaust-valve does not open until after the flame of combustion is extinguished as the result of there being no more fuel left to burn on that stroke. Consequently, when the exhaust-valve opens nothing but hot gases should escape. However, if an exhaust-valve gets leaky, the valve becomes almost incandescent as the result of the escaping flame which licks the stem and in-

A Veritable Human Document—

—is this absorbingly interesting report, written specially for this magazine by the former chief engineer of an American motorship, which after nearly three years of reliable service suffered a series of troubles and delays. The author in giving his side of the matter has shown proper restraint and mental balance, considerable intelligence and a close knowledge of Diesel-engine operation, which will impress those who read it. His story dwells upon living conditions aboard ship as an engineer sees it, a side that every shipowner should become familiar with, because knowledge of the seagoing man's angle will assist closer co-operation of owners and men. For obvious reasons all names have been eliminated. Every shipowner should read this document!

terior of the cage. The intense heat set up in the cylinder head casting in the vicinity of the exhaust-valve then brings about heat-stresses which are not normal and which in time develop cracks. These stresses must be repeated many times before such cracks develop. Consequently our first experience with salt water and leaking exhaust-valves did not reveal all of the troubles which later became manifest.

After our first experience it would seem that good judgment and a sane business policy would have prompted extreme caution to prevent a recurrence. However, I cannot say that great caution was taken. True enough, the bottom of the vessel was surveyed and pronounced in good condition not only by the owner's representative but by Lloyd's surveyors as well. But, at all times there have been rivets in the fore deep-tank which were questionable. On a steam vessel it is doubtful whether the expense of steaming tanks and redriving rivets would be justified with the rivets in no worse condition than those in this motorship, for only an increase in fuel consumption and dirty furnaces would result from leaks which might develop. If such leaks did not develop the cost of repair would be at least delayed until later. But, with a motor-vessel the delay in making such an expenditure so threatens the life of the engines that the outlay should be made at once. Such makeshifts as electrically welding should be avoided, for, be it known a rivet which is built-up by that process and then caulked down is no longer body-bound. As soon as corrosion attacks the head the rivet is loosened and leaks freely.

Although I did not agree with the owner's methods of having tanks repaired, in justice to them I must state that the last time we had leaking tanks it was the result of a cracked plate apparently brought about by severe weather.

Hunting the Trouble

A brief outline of the salt water trouble I feel will be best. About two and a half years ago we noticed on a transatlantic voyage, that our exhaust-valves were giving more trouble than usual and that a deposit was forming upon the seats. We sent one of the valves to the engine-builder's plant for survey by them and an explanation of the trouble. With ample spare valves we sailed, and our troubles increased somewhat. Upon our return I was advised that the trouble with the valves was brought about not through any mechanical defect, but because a foreign substance was building-up on the seats, then cracking and allowing the fire to burn the metal while escaping through the leak. As a matter of fact, no one knew what the real trouble was, but most every one—myself included—laid it to fuel and let it go at that.

The following voyage our troubles with valves became so great that upon our return I insisted a thorough investigation should be made, and I ordered a new set of valves. The order for the valves caused the owners to send for the engine builders post haste. Several samples of deposits were taken for analysis, and the report came back that the foreign substance contained ninety odd per cent. of sulphur and sulphate of iron. I knew this to be untrue and did not conceal my view, which later brought a request for more samples of the deposits.

We had pulled some pistons and overhauled all valves while undergoing our Lloyd's annual survey, cleaned the bunkers and replaced an air-compressor cylinder which had been damaged by sulphur fumes. Then we put to sea with the fuel remaining from the previous voyage, bound for a Gulf port. The trip South was a nightmare, but we arrived with one clean dry bunker and took new fuel aboard there. Our troubles immediately ceased when we fed the clean fuel to the motors.

In discussing fuel-oil specifications with one of the inspectors of an oil company I learned of salt water in suspension, and wrote a letter to the owners stating that I knew the trouble. You see, I wanted the honor of finding the trouble and sent that letter immediately I was sure, so as to "beat any one else to it." Upon our arrival North I received a letter from the owners, giving the engine builders' deductions. The second analysis had revealed almost one hundred per cent. "chlorine," and led to the conviction that sea-water had found its way into the engine either through the fuel or through the "breathers" (air intakes).

Thereafter, we knew what salt water meant, but the owners never seemed to appreciate just what the trouble was leading to. The ship was turning around in good time, and my reports that we were keying up on wrist-pin bearings pretty regularly did not worry any one but the ship's engineers, who had to do the work, and myself, who knew that when the time came for re-installing them there would be a great hoorah made over the expense involved. The Diesels just naturally worked themselves out of the difficulty. Bearings commenced to act normally, and the cylinders stopped their excessive wear. If no more hull leaks had developed, the motors would be running today with little damage done.

Leaks Start Again in the Bunkers

Some time later my crew was reduced by three men, and we started experimenting with boiler-fuel with tolerably good results. It was more than a year before our tanks developed more leaks, and during that year I was led to believe that the owners were more than pleased with results.

The second time the tanks developed leaks, the effect was far different, because the salt, in destroying the atomizing apparatus, made it impossible to bring about perfect combustion of the boiler fuel. In view of our shorthanded condition we could not remove many fuel and exhaust valves at sea, place them in good condition and proceed on our way without long shutdowns; yet it was essential that we make port before stores and water gave out and before the fuel was burned in the boilers. We forced the ship into a South Atlantic port—being bound for the Gulf—took fresh fuel, and proceeded to destination to load.

The owners insisted that quick turnarounds be made, and, to keep peace in the family, I formed the bad habit of letting the captain turn the ship around against my better judgment and put to sea. To be slangy about it, they kept stepping on my tail continuously. I felt in my bones that eventually I would be the goat. If I could not turn the ship around I would be out of a job at once, and if I did I would be out of a job later. The result was that I kept staving off the evil day, not without many long laments to the steamship department, but staving it off nevertheless.

At a Gulf port we changed a set of valves, cleaned-up the lubricating system and keyed-up on the cranks and wrist-pin bearings—then sailed for France. Upon our arrival home everything was pretty sloppy, but we had to turn around quickly. We could only repair the worst wrist-pins and change rings in the pistons which were blowing by badly and then sailed again. After three transatlantic voyages we had all pistons and bearings in good condition.

With a "Green" Crew

The steamship department then decided that our system had been all wrong, and that if we had a recurrence of the salt-water trouble we should pull all pistons at once and save the bearings. We did this last winter when we had another dose of salt water, much worse than any before because on that voyage I was the only engineer aboard who had sailed on the ship before. My assistant engineers were picked-up regardless of their experience. I had only two oilers who had been on the ship with me before. With leaking tanks, heavy boiler-fuel, "green" engineers and a succession of heavy westerly gales, we could do even less work at sea than on any previous voyage, for, in addition to our engine troubles, the condenser was leaking badly, the boiler feed-water lines broke in eleven different places, and the steam-driven generating-sets gave a lot of trouble as the result of the boilers priming with so much salt in them.

The motors were in bad condition when we arrived, but, as I said, we pulled all pistons, changed some rings and renewed the exhaust valves, while attempting a quick turnaround. The shipyard worked three days and nights without a stop to finish up. Such a long stretch of overtime cannot give satisfactory results, and we almost drifted away to sea, there to straighten things out as best we could.

By this time the vessel had "steamed" with her present Diesel motors in the neighborhood of 140,000 miles. During that time we had not lifted the pistons to adjust compression but of late the motors had been starting hard.

(To be continued)

Sea trials of the 900 tons d.w. motor-vessel Oswiga, owned by the Reederei A. G. Von, 1896, of Hamburg, were run on May 13th. A 500 shaft h.p. oil-engine is installed. She was built at the Norddeutsche Union Werke, A. G., Boizenburg, Germany.

Interesting Notes and News from Everywhere

AN order has been placed by the Standard Oil Company of New Jersey for a Diesel-electric barge for bay and river service.

A 10 b.h.p. Bolinder oil-engine has been installed in a codfisher owned by N. Johnson, Unga, Alaska.

TROY SOCONY is the name of the Standard Oil Company of New York's new Diesel-driven canal tanker.

America can aid in the economic re-construction of Europe by sending over advertising and selling men, says C. Harold Vernon, President-elect of the Thirty Club of London.

"K-26," a big, steam-driven submarine, built by Vickers, Ltd., was recently commissioned. She is the last of the British Admiralty "K" series.

The new French naval bill shortly to be introduced includes 30 first-class coastwise submarines and 4 ocean-going submersibles to be completed between 1925 and 1930.

The Danish Diesel-auxiliary sailing-ship KÖBENHAVN arrived at Göteborg, Sweden, early in May from Buenos Aires with a cargo of 5,000 tons of grain.

Recently the trip from Seattle, Washington, to Ketchikan, Alaska, was made in 76 hours by the 60 ft. halibuter, VENUS, which is equipped with a 50 b.h.p. Bolinder oil-engine.

Altogether six motorships have been ordered by Andrew Weir & Co., of Glasgow, from Harland & Wolff's Govan shipyard. Three are single-screw vessels and three twin-screw.

In the tug TOUQUES, owned by the Office Nationale de Navigation (France), a Sulzer 420 b.h.p. two-cycle Diesel engine is installed. This is one of ten similar boats with Sulzer oil-engines.

The new 713 tons submarine KX of the Royal Dutch Navy was launched during May at the De Schelde Shipyard. Twin 800 b.h.p. Schelde-Sulzer Diesel engines are installed.

During the middle of May, Mr. E. H. Hutton's motor-yacht HUSSAR ran trials at Copenhagen. A speed of 12 knots under power alone was maintained. She should arrive in New York during July.

One of the two 10,000 tons d.w. motorships recently ordered by the Nippon Yusen Kaisha from Harland & Wolff, Ltd., will be built at the yard of D. & W. Henderson & Co., a subsidiary of Harland & Wolff.

World's Record of New Construction, Ships' Performances and Other Matters of Note in the Motorship Field

The 50 ft. American naval steam picket-boat, which Capt. A. S. French has converted to 65 b.h.p. Atlas-Imperial Diesel engine, had considerable structural alterations when the vessel was converted.

The Cunard Co. has chartered the Anchor Brocklebank's motorship MALIA, now propelled by twin 1,000 shaft h.p. Cammell Laird Diesel engines. She loaded recently at Swansea, Wales, for Mediterranean ports.

A hydraulic coupling permitting a number of Diesel engines to be coupled to one reduction-gear, thus permitting very large power per shaft has been developed by the Vulcan Werke A.-G., of Hamburg, Germany.

For the Pacific Coast-European trade, three motorships with refrigerator holds are being built for the Furness-Prince Line (Furness, Withy & Co.). A story on their DOMINION MILLLER is given elsewhere in this issue.

Now under construction at Lithgow's Limited, Kings Shipbuilding yard, Port Glasgow, is a vessel in which will be installed twin Werkspoor type Diesel engines recently constructed by Hawthorne, Leslie & Co., Newcastle-on-Tyne, England.

WAJANG is the name selected for the Rotterdam Lloyd's new Schelde-Sulzer Diesel-driven 7,000 shaft horsepower passenger motorship. Except for the machinery, she will be a sister vessel to their turbine steamer SLAMAT, also under construction.

Arnold Bernstein, of Hamburg, has had another warship converted by the Deutsche Werke to oil-engine power. This is the FRITHJOF, 2,000 tons d.w., length 81.4 m., breadth 14.87 m., depth 6 m. She will be used for transporting lumber and locomotives to Russia.

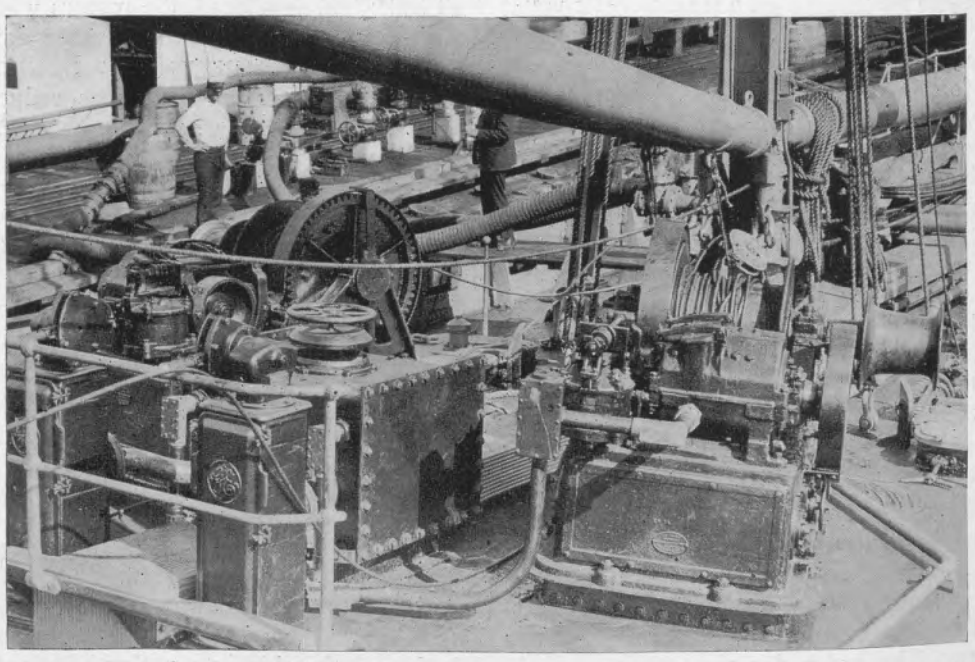
CRUX, the new 6,700 tons cargo motorship built by Burmeister & Wain for the Bergen Steamship Co., of Bergen, Norway, was launched on May 9th. Twin 1,100 i.h.p. Burmeister & Wain Diesel engines are installed. Length 367′, breadth 53′, depth 34′.

Fifty new cast-iron piston-rings were made at the Cristobal Shops of the Panama Canal for the new German motorship ODENWALD, which was illustrated in MOTORSHIP for June. Evidently German oil-engine builders will do well to buy American piston rings.

A second slow-speed Harland-B. & W. Diesel marine engine is building by J. C. Kincaid & Co., Greenock, Scotland, but for British shipowners. Their first engine was of 1,800 shaft h.p. and was to the order of a Spanish firm for the motorship ARANTZ MENDE. The second engine is of 1,600 i.h.p.

An 8,000 tons motor-tanker named URANO has just been launched by the Deutsche Werke, Kiel. Twin Deutsche-Werke 950 shaft h.p. four-cycle Diesel engines are being installed. Length of ship 398′, breadth 54′, depth 30′. Propeller and engine speed 130 r.p.m.

SAMONA, a 115 ft. triple-screw motor-yacht building to the order of W. H. Hole, of Arlington, Cal., will be launched during the Fall by the Blanchard Boat Co. at the Tregoning Mfg. Co.'s Salmon Bay Yard. Three 100 b.h.p. Atlas--Imperial Diesel engines are being installed. The boat will have 18 ft. beam and 5½ ft. draft.



Part of the deck machinery on the Standard Oil Co.'s Diesel-electric tanker "Standard Service," showing the Cunningham-General Electric winches

To transport oil from Oklahoma to Bayonne, N. J., where ships bunker through the pipe lines costs only from 38 to 39 cents per barrel compared with $1.88 in tank cars over the railroads, says Chas. M. Haskell, former Governor of Oklahoma. Power for the pipe lines is by Diesel oil-engines, but the railroad locomotives burn coal.

A back draft from the furnace of the oil-fired boilers ignited the oil in the engine-room bilge of the steam-tanker MINA BREA on May 16th in Cristobal Harbor. The fire spread through the fidley hatch to the superstructure. The blaze was extinguished in 20 minutes, but repairs took five days. Safety first! Install oil-engine power!

The Golden Cross Line of Cardiff, Wales (Owen, Watkin Williams & Co.), will soon take delivery of their first motorship. This is the MARGRETIAN, 2,800 tons d.w.c., launched recently at the yard of Charles Hill & Sons, Bristol. Twin Diesel engines are being fitted. Length of ship 310′, breadth 46′ 6″ depth 26′.

Trials of the 2,100 tons d.w. motorship VIBEN, built for the A/S Cygnus of Cristiania, Norway, by the Langesunds Mek. Verksted, were run during the middle of May. Twin 250 b.h.p. Bolinder oil-engines drive this vessel at 9½ knots. Her length is 225′, by 37′ 6″ beam, and 22′ depth. The deck machinery is steam driven.

Recently the new cargo motorship DURENDA, under charter to Norton Lilly & Co., was in New York, and received some minor overhauling at the Morse dry dock. She sailed for Australia, and will return to New York. Her owners are the British India Steam Navigation Co. She is powered by twin 8-cylinder North British Diesel engines.

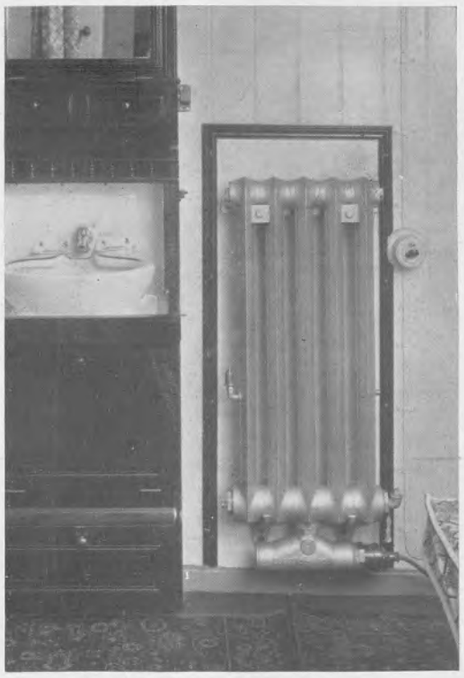
For the construction of two Diesel-electric canal freighters a loan of two-thirds of $300,000, the latter representing the building costs, has been made at 5% by the U. S. Shipping Board to the Duluth Terminal Warehouse Co. The Board is empowered to make loans at 2% or higher for this purpose. By July 1st. the Board expects to have $50,000,000 available for loaning purposes for new motorship construction.

Three more Diesel-engined cargo motorships reported in our May issue as having been ordered by Andrew Weir & Co., from Harland & Wolff's Govan yard will be of 10,000 tons d.w. each, 420′ long and 3,000 h.p. in twin screws. Three single-screw motorships are also building for the Weir concern at this shipyard, where all the ways are now filled.

Vickers-Petters, Ltd., Ipswich, England, are building the two 500 shaft h.p. surface-ignition oil-engines for two tugs building at J. Samuel White's yard in East Cowes, for the Egyptian Ports and Lights Administration of the Ministry of Communications. The tugs will be employed in Suez Harbor. Through an error, we said in our May issue that White oil-engines would be installed.

HERMES, the high-powered, sea-going motor-tug and salvage-boat referred to some months ago as building at the Norderwerft A. G., Hamburg, for the Bugsier Reederei & Bergungs of the same port, is now complete and has run trials. She is powered with twin 550 i.h.p., six-cylinder, four-cycle A. E.G.-B. & W. Diesel engines and is 132′ long, by 22′ 8″ breadth and 12′ 6″ draft. Speed 13 to 14 knots.

Now under construction at Arthur D. Story's yard, Essex, Mass., is a 140 gross tons auxiliary fishing-schooner, which has been named SHAMROCK by her owners, O'Hara Bros. of Gloucester, Mass. In this vessel a 160 b.h.p. four-cylinder, two-cycle



A Benham electro-vapor radiator for motorship and motor yacht cabins

Bolinder oil-engine is being installed. It is expected that she will be completed August next. Her length is 140′ o.a., by 110′ on the water line, with 25′ 9″ breadth, 12′ draft and 14′ depth.

The wooden motorship BALCATTA has been re-named PRESIDENT ALESSANDRI by her new owner at Talcahuano, Chile, who is operating her on the Chilean coast. Some time ago she struck a rock and damaged her keel. While being towed to Talcahuano in a heavy gale, she became so waterlogged that she capsized and was brought into harbor with only her keel showing. Afterwards she was overhauled. This vessel is powered with twin McIntosh & Seymour Diesel engines.

William M. Connelly, a marine lawyer of Buffalo, N. Y., who recently gave up law practice in Cleveland to go into the transportation business, has been appointed Manager of the Great Lakes motorship, FORDONIAN, with offices at 822 Marine Bank Bldg., Buffalo. The ship is owned by the Mediterranean Steamship Co., of New York City, and is the only Diesel-electric ship at present on the Lakes. She was built in 1912 for Canadian owners, and converted about two years ago.

After a very interesting career since 1882 when she was built for a bar tug, the 136 ft., steam-driven vessel, BELLINGHAM, ex-WILLAPA, ex-GENERAL MILES, has been converted to a motorship, having been changed to oil-engine power. In the fall of 1922 a 200 b.h.p. Fairbanks-Morse oil-engine was installed at the plant of the Lake Union Drydock & Machine Works, to the order of the Sunny Point Packing Company. She is now being used to carry supplies to the canneries in the North, and to bring canned salmon back.

So satisfactory has been the performance of the Pacific Diesel Engine Works built oil-engine aboard the excursion boat GALVES, at Galveston, Texas, that two orders for similar engines have been received lately from persons acquainted with GALVES' behavior. The engines ordered are a 110 b.h.p. three-cylinder, airless injection oil-engine, purchased by John Jacobson, of Galveston; and a 150 brake horsepower four-cylinder set of similar type ordered by C. L. Ashton, of Houston, Texas. Both are to go into tugboats. Another of the 110 horsepower three-cylinder oil-engines of this make has been ordered by the Lillico Tug & Barge Co., of Seattle, also for a tug.

The French Minister of Marine recently announced the construction of two tankers for supplying fuel-oil to the Navy, and appointed Mons. de Chappedelaine to make the necessary investigation. The latter's report recommends Diesel power for these vessels, as well as for all future tankers on the grounds of economy. One of the new motorships may be named BAKOU. At present under the French flag are 19 tankers aggregating 131,600 tons d.w. of which five, the JULES HENRY (Werkspoor Diesels) MOTROCINE (Werkspoor Diesels), the CITÉ DE SPARTE (Nomand Diesels), CITÉ DE ATHENS (Normand Diesels) and the auxiliary QUEVILLY (Nürnberg Diesels) are oil-engined.

Sea trials of the 6,000 tons d.w. Spanish motorship ARANTZ MENDI were run on the 23rd and 25th of April at Bilbao, and the vessel proceeded to Philadelphia and New York, where she recently arrived after a most satisfactory maiden voyage. Plans of this vessel were published in MOTORSHIP. She is owned by the Cia. Naviere Sota Y Anzar, of Bilbao, and was built by the Cia. Euskalduna de Construccion Y Reparacion de Buques, but her 1,800 shaft h.p. six-cylinder, long-stroke Diesel engine 29.73″ bore by 59.20″ stroke, turning at 90 r.p.m. was constructed by J. C. Kincaid & Co., Greenock, Scotland, under Harland-B. & W. license. Her trial speed was unusually high for a vessel of this type and power, being 13.3 knots. Her displacement on trial was 8,603. Two 65 k.w. Diesel-electric sets are installed as auxiliary power.

Our Readers' Opinions

(The publication of letters does not necessarily imply Editorial endorsement of opinions expressed)

VACUUM OIL COMPANY LAUDS MOTORSHIPS

May 28, 1923.

To the Editor of MOTORSHIP:

I understand there is a rumor abroad, credited directly or indirectly to this Company, and probably to the writer, that we are generally condemning the use of motorships, and I take this means to express my surprise and regret that a statement which is so directly at variance with fact should have been made.

The statement, on its face, is absurd and ridiculous in the extreme. While our equipment generally are reciprocating steam jobs, we have a motorship which, during the last 90,000 miles of service, has run efficiently, economically and satisfactorily—so much so that I voluntarily wrote a letter last week to Mr. Ballin, President of the McIntosh & Seymour Corporation, advising him of the general satisfaction with the service of our M/S BAYONNE equipped with this type of engine.

Any statement purporting to have come from this Company, its Steamship Department, or from the writer as a Director, representing that department, that we were condemning them as a general practice, or that certain well known steamship companies were replacing their motor equipment with steam, is not founded on facts and is absolutely incorrect, I have no hesitancy in authorizing you to use this statement if you care to do so to correct an impression which I cannot understand was ever conceived or started. Certainly it is without my knowledge or official sanction or that of the Steamship Department or Directors of this Company.

CHARLES E. BEDFORD.

Vacuum Oil Co.,
New York City.

THOSE 2-CYCLE DOUBLE-ACTING ENGINES NEVER HAD A FAIR SHOWING

To the Editor of MOTORSHIP:

The MOTORSHIP of April, 1923, brings the news that the double-acting two-cycle engine of the ASSYRIAN will be removed and replaced by steam. The pioneer engine of a type in which the world ten years ago placed great hopes thus ends its career in a very unfortunate way.

The field of the double-acting two-cycle engine naturally lies in the largest sizes we ever intend to build as reciprocating oil engines. If an engine of as small as 850 b.h.p. was chosen for the then FRITZ it was for none other than the simple reason of trying the new type in the smallest practical size and with the fewest possible cylinders. Nothing illustrates better the purely experimental character of the engine than the fact that its power output of 850 b.h.p. falls well within the range of the four-cycle trunk-piston type with six cylinders. Since this little engine had all the refinements connected with its type, refinements belonging in reality to an engine of about ten times its size, it naturally was more complicated than most other engines of equal size.

This experimental engine, through the fortunes of war, got into the hands of a crew unfamiliar with its good and bad points and uninterested in its success. The result is the scrapping of the machinery—not so surprising after all. If the ship had remained in German hands it probably would also by now have had her engines scrapped, but for other reasons. The builders would have watched the sea performance of the boat, and after learning everything that could reasonably be expected from these little engines, they would have replaced them by a type better suited for this size.

It is regrettable that no sea trials could be made under the supervision of the builders and that the sea experience is lost to the world at large. In designing and testing the two sets of experimental engines, however, the builders acquired a large amount of experience specifically connected with this type. All the basic questions regarding the shape of the lower combustion chamber and arrangement of valves, the design of cylinder and piston, of lower cylinder-head and stuffing box, the question of cooling has been solved in a thoroughly satisfactory way. There is no doubt that Blohm & Voss will build more engines of this type and of sufficient size any time they are wanted, and they will stand behind them with their guarantee and make them a success. Keen competition will force the oil engine builders to make lighter and cheaper engines. And just as we now see the double-acting four-cycle Burmeister & Wain engine coming into the field, so the double-acting two-cycle type will find its place if the demand for still larger h.p. output per unit keeps on.

F. P. GRUTZNER.

St. Louis, Mo.

ORDERING CABLE SHIPS ABROAD

To the Editor of MOTORSHIP:

Your editorial, in your June issue, captioned "Cable Ship Orders," is very much to the point; but, to my mind, far too moderate. You refer to "thousands of dollars," as having been spent by American ship and engine builders, in working up the estimates for this transaction; you should have written "well into the six figures in dollars."

Your editorial touches an old sore, which needs a physician or surgeon. This is the extent of the economic waste from which our industries suffer, because of the unnecssarily heavy expenses to which, apparently without any compunction whatsoever, an occasional prospective purchaser subjects them, by calling for fully detailed bids (preferably with several alternates), with elaborate specifications and costly drawings, before he has anything more than the remotest idea of what he wants to buy; using this expensive matter to assist him in making up his mind; and then calling for a full encore in another key. And frequently he does not limit himself to the luxury of one change of mind; but, having several, calls for a full line of "education" for each successively. Of course, the industries must, and do, reimburse themselves for such expenses, by adding them to their "overhead"; but this is harmful in the unnecessary increase in prices, and obviously unfair to the intelligently conscientious purchaser, who has to bear a part of the useless expense, for which he is not blameable. Can you suggest a remedy?

MAX ROTTER.

The Western Union Cable Ship.

[If shipowners will reply to this interesting letter we will be glad to devote space to their publication. —*Editor.*]

To the Editor of MOTORSHIP:

In the best interests of Diesel engineering permit me to call your attention to some exaggerated and distorted data presented in the article on page 280 of the April issue of MOTORSHIP entitled "Noteworthy Voyage of the HERMAN." The writer of this article evidently takes for granted the figures presented by Capt. C. T. Pedersen and restates that the Diesel-engine uses only 8 gallons of oil per hour, etc. In favor of the data presented let us assume that the fuel oil used was 26° Beaumé, which would have a specific gravity of 0.8974 at 67°F. Assume a good fuel of 19,000 B.T.U. per pound. 1 cu.ft. of water at 60 F. weighs 62.37 lbs.

Then the fuel-consumption per b.h.p. hour expressed in lbs. for the 250 b.h.p. Atlas-Imperial Diesel at an 8 gallon per hour rate, would be

$$\frac{8\times231}{1728}\times\frac{62.37\times.8974}{250}=0.239 \text{ lb. per b.h.p. hour}$$

This at once appears to be a fallacy, for the thermal efficiency would be:

$$Y=\frac{\text{Output}}{\text{Input}}=\frac{\frac{33{,}000\times60}{778}}{0.239\times19{,}000}=56.1\%$$

The 19,000 B.T.U./lb. assumption is slightly high but is favorable for the high thermal efficiency claimed.

I do not know the operating temperatures of the Atlas-Imperial Diesel, but I doubt whether a Carnot cycle operating with the same temperature range would show a thermal efficiency of 56.1%.

The same calculations with the data as given by the Trout Diesel in the advertisement on the back cover page, viz., 6½ gallons of 26° Beaumé for a 100 b.h.p. engine gives a thermal efficiency of 27.5% which is, no doubt, correct.

For the benefit of those who are interested in Diesel engine performance I think the distorted statements referred to stand printed correction.. I trust you will accept this correction in the spirit in which I send it.

ALEXANDER H. BASS, M. E.

920 E. 16th St., Chester, Pa.

[In the first few lines of the article about the HERMAN'S voyage it was distinctly stated that the vessel is a three-masted auxiliary schooner. Mr. Bass has assumed that the engine would operate at full power during the entire 2,283½ engine hours. Such an assumption is unwarranted in the case of an auxiliary vessel.—EDITOR.]

Our Special Supplement

Extracts from Letters We Have Received, and Extracts from Letters Received by The Falk Corporation

To the Editor of MOTORSHIP:

The President asks me to thank you for yours of May 17th and for the copy of the magazine which accompanied it. He found the latter extremely interesting.

GEO. B. CHRISTIAN,
Secretary to the President.
The White House,
Washington, D. C.

To the Editor of MOTORSHIP:

Upon my return to the city to-day I found copy of the Falk Company's special Supplement to MOTORSHIP. I wish to take this opportunity to compliment you on this very fine supplement.

R. E. FRIEND,
Secretary.
Nordberg Mfg. Co.,
Milwaukee, Wis.

To the Editor of MOTORSHIP:

I wish to thank you for the special Falk Supplement to your May issue of MOTORSHIP. I am especially interested in this Supplement as I had the pleasure of visiting the Falk Works a couple of weeks ago. It seems to me that this Supplement is one of the most comprehensive and attractive write-ups on a plant and one of its products that I have ever seen.

W. D. POMEROY,
V.-P. and Gen'l. Mgr.
The Gould Mfg. Co.,
Seneca Falls, N. Y.

To the Editor of MOTORSHIP:

I have received the Special Falk Supplement of MOTORSHIP, introducing the Falk Oil Engine. The gear drive is a most interesting development of the Diesel Engine, which we shall watch with great interest.

J. HOWARD PEW,
Sun Oil Company, President.
Philadelphia, Pa.

To the Editor of MOTORSHIP:

Congratulations upon your Falk Supplement. To one who is just a reading subscriber like myself it was a "treat." Closing the first year of enjoying MOTORSHIP, I wish to say that in typography, interesting subject matter, editorials and all else that goes to make up an engineering magazine you are certainly setting "pace" for the technical press.

PAUL L. MAJOR.
434 Mirabeau St., Greenfield, Ohio.

To the Editor of MOTORSHIP:

Please accept my thanks for the special Falk Supplement to the May 1923 issue of MOTORSHIP.

T. ROOSEVELT,
Acting Secretary of the Navy.
Washington, D. C.

To the Editor of MOTORSHIP:

Dear Mr. Lisle: Mr. Morse has asked me to thank you for the Falk Supplement. He was greatly impressed with the manner in which this work was done.

D. V. STRATTON.
Morse Dry Dock Repair Co.,
Brooklyn, N. Y.

To the Editor of MOTORSHIP:

This is in acknowledgement of the Falk Supplement to your May issue of MOTORSHIP, which came to hand this week. We have recently purchased a tanker equipped with Falk-geared engine, and therefore were especially interested in the publication you sent us.

J. W. VAN DYKE.
President.
Atlantic Refining Co., Philadelphia, Pa.

To the Editor of MOTORSHIP:

I have noted with interest the copy of the special supplement to the May issue of MOTORSHIP giving a description of the Falk Oil Engine.

A. W. MELLON,
Secretary of the Treasury.
Washington, D. C.

To the Editor of MOTORSHIP:

We beg to acknowledge receipt of the Supplement to your May issue of MOTORSHIP. There is no question as to the artistic manner in which you have illustrated the Falk oil engine in this supplement, and you have certainly brought this new engine to our attention in a very forcible manner.

C. H. HAUPT.
Standard Oil Company. Elizabeth, N. J.

To the Editor of MOTORSHIP:

The Special Falk Supplement was very interesting indeed, and I desire to compliment you on the very able manner in which you set forth the good points of the Falk Engine and Gears.

GEO. B. DRAKE.
The Texas Company, New York.

To the Editor of MOTORSHIP:

I was amazed to see the extent to which the Falk Corporation have proceeded with their plans for the development of the geared Diesel.

The Falk gears have an excellent reputation so I am informed by those who have had extended experience with them, so with good gearing, ample courage and skilled engineers they may go far. In any case, we shall watch their progress with interest.

I suppose the Falk people have knowledge of the "Muensterland" equipped with submarine engines and gears. This is the only good sized job I had heard of up to the time of the receipt of the Supplement to MOTORSHIP for May.

The Supplement itself is a beauty and I congratulate you on its production.

E. C. TOBEY, Vice-President.
United American Lines,
New York.

To the FALK CORPORATION:

Please accept my thanks for the MOTORSHIP—Special Falk Supplement. I have read the same carefully and congratulate you on the splendid manner in which all the details of your new oil engine are described.

If this new engineering venture on your part anywhere near approaches the success which has attended your Falk gears, I predict for your engine a brilliant future.

C. A. MCALLISTER,
Vice-President.
American Bureau of Shipping,
New York.

To the FALK CORPORATION:

Through the courtesy of MOTORSHIP, I have received a copy of their Supplement to the May issue, illustrating and describing your plant and the machinery which you construct.

I have found this handsome book very interesting and wish to compliment you not only upon the way in which you have told the story of your business, but also upon the splendid plant which you have for the development and manufacture of your specialties.

I am turning this over to Mr. Geo. B. Drake, manager of the Marine Department of The Texas Company, who will I am sure, find in it much of interest to him.

E. C. LUFKIN, Chairman.
The Texas Company,
New York.

May 24, 1923.

To the Editor of MOTORSHIP:

The "Falk" Supplement, so kindly mailed me under personal cover, is a work in which you are justified in taking pride. That it will be valuable to the Falk Corporation goes without saying.

R. H. M. ROBINSON, President.
United American Lines, Inc.
Executive Dept., New York.

May 26, 1923.

To The Falk Corporation:

I received a copy of the special publicity Supplement to the May issue of MOTORSHIP, introducing the Falk Oil-Engine. After carefully reviewing this wonderful description of a new type of propulsion, our opinion is, that this is a great improvement over the former Diesel designs and should merit serious consideration by shipowners before deciding on their motive power.

The high type of work turned out by your Company requires no comment and it will be most interesting to follow the performance of this engine for which we predict a great future.

SINCLAIR NAVIGATION COMPANY,
J. G. Johnson, Marine Superintendent.

To The Falk Corporation:

We have received a copy of MOTORSHIP'S Special Supplement, which we have found quite interesting and instructive. Falk gears need no introduction to us for we have been satisfied users for over three years. Should your Diesel engines measure up to the standard set by your gears you should have quite a sale as shipowners undoubtedly are turning more and more to this type of propulsion.

It is our belief that the maker of the most fool-proof engine, coupled of course with economy, will be more successful in the end. However to compete with other nationalities we must operate with the same costs as they, and in order to obtain thoroughly competent engineers to operate highly complicated machinery, with most likely no more mechanical operating efficiency we must pay them more salary than at present, which will be against us in operating costs. Hence our reason for believing that simplicity and fool-proofness and their not requiring highly specialized engineers must be the keynote of American Diesel engine construction.

THE CAROLINA COMPANY,
W. P. Lambert, Marine Superintendent.

To the Editor of MOTORSHIP:

The supplement describing the Falk oil-engine and reduction gear was on my table when I returned from the trials of the DETROIT. I will endeavor to digest this treatise in the next few days, and will have pleasure in sending you a few comments.

R. WARRINER,
Chief Engineer.
Bethlehem Shipbuilding Corporation, Ltd.,
Quincy, Mass.

To the Editor of MOTORSHIP:

I wish to thank you for the issue of MOTORSHIP which is very interesting and well gotten up and I shall take great pleasure in writing The Falk Corporation.

A. A. Ross,
Gear Division, Turbine Eng. Dept.
General Electric Company,
Schenectady, N. Y.

May 26, 1923.

To The Falk Corporation:

T. Orchard Lisle, Editor of MOTORSHIP, mailed us a copy of a special supplement describing and illustrating the development and construction of your first set of geared marine internal-combustion engines.

Your booklet has been found very interesting, and you are to be congratulated in successfully overcoming the many difficulties inherent to the development of a new form of prime mover for ship's propulsion.

Should you, in the near future, have an opportunity to instal this or a similar unit in a merchant vessel, we would be greatly interested in ascertaining the results obtained under marine service conditions, and it is hoped you will keep us posted in this matter.

W. S. BENSON,
Commissioner.
U. S. Shipping Board,
Washington, D. C.

To The Falk Corporation:

The supplement to the May issue of the MOTORSHIP was only received this morning, and I have not had an opportunity of reading it, but will take great pleasure in reading it very carefully as this is a subject I am very much interested in.

R. M. DOLLAR.
Dollar Steamship Lines,
San Francisco, Cal.
May 30th, 1923.

May 24, 1923.

To The Falk Corporation:

Please accept my thanks for the copy of supplement to the May issue of MOTORSHIP, concerning your plant and your newly developed oil-engine, which pamphlet I find very interesting.

R. D. GATEWOOD,
Manager.
U. S. Shipping Board,
Emergency Fleet Corp.
New York.

To The Falk Corporation:

I am in receipt of a copy of the Special Falk Supplement issued with the May, 1923, issue of MOTORSHIP. The Chief of the Bureau of Engineering informs me that a copy of this Supplement has already been received by that Bureau. He further informs me that this Supplement was carefully studied with great interest by the Division concerned in the Bureau.

T. ROOSEVELT,
Assistant Secretary of the Navy.
Washington, D. C.

To The Falk Corporation:

I recently received from the Editor of MOTORSHIP copy of the issue describing your new engine and gear cutting equipment, and take this opportunity to compliment you on the way this is gotten up as I am particularly interested in the gear section.

A. A. Ross,
Gear Division, Turbine Eng. Dept.
General Electric Co.,
Schenectady, N. Y.

To The Falk Corporation:

We are in receipt of the special supplement to the May issue of MOTORSHIP. We have to thank you for this and for the very useful information contained in it.

CANADIAN GOVERNMENT MERCHANT MARINE, LTD.,
D. B. Carswell, Superintendent Engineer.
Montreal, Canada.

To The Falk Corporation:

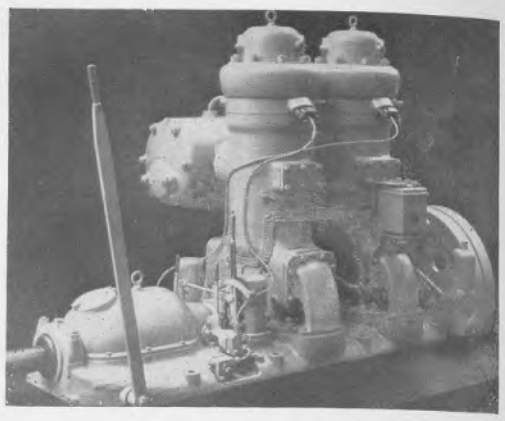
We have received copy of MOTORSHIP supplement covering your new geared Diesel sets for marine propulsion, and wish to thank you for favoring us with this very complete description of your new product.

THE WILLIAM CRAMP & SONS SHIP & ENGINE BUILDING COMPANY,
J. F. Metten, Chief Engineer.
May 31, 1923.

[*Additional letters will be published next month.—Editor.*]

IMMIGRATION FOLLOWS THE FUNNELS

In the design of the 17,000-ton GRIPSHOLM, which is being built on the Tyne for the Swedish-American Line, a departure has been made from the established Scandinavian motorship precedent by fitting her with two big funnels. Up to now the Scandinavians have always maintained that to carry the exhaust of a motorship through a funnel is a great mistake, because a noisy echo is bound to be produced, which will worry the officer on the bridge considerably when he is trying to catch every sound through a fog. British motorship owners, on the other hand, have always been in favour of funnels because they consider the noise difficulty is negligible and regard easy identification of a ship at sea as the very best possible advertisement for the company. The reason of the decision in the case of the Swedish American Line is that the Scandinavian emigrant goes a lot by appearances, nearly as much as do the Poles and Russians, and is tremendously impressed by funnels. An example of this was seen some years ago when the Anchor Line used a picture of their three-funnelled steamer COLUMBIA as an advertisement and had a lot of trouble because a large batch of Polish emigrants flatly refused to embark in a single-funnelled ship which was every bit as good and which was taking the sailing.



60 b.h.p. surface-ignition marine oil-engine built at the Deutsche Werke

SMALL ENGINE CONSTRUCTION AT THE DEUTSCHE WERKE

In past issues of MOTORSHIP we have described and illustrated the Deutsche Werke (Germany) marine type Diesel engine, the first twin-screw sets of which were furnished to an Italian oil tanker. In addition to this large crosshead-type Diesel engine the Deutsche Werke have entered into the construction of small surface-ignition oil-engines.

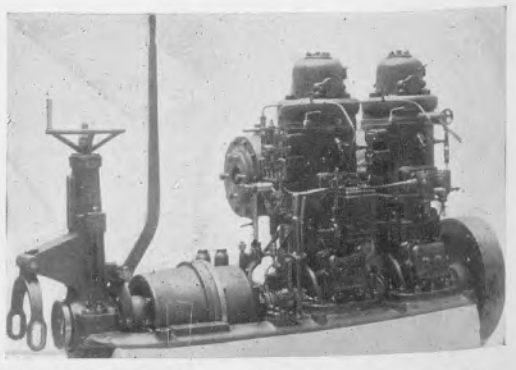
From a study of the illustrations we would suggest that the surface-ignition engine in Germany has not reached the advanced stage that this type of motor has reached in America. The range of oil-engines built at the Deutsche Werke is as follows:

Number of Cylinders	*Capacity H.P.*	*Revolutions Per Minute*	*Weight in Pounds*
1	8	500	1,540
1	12	475	1,980
1	18	425	3,300
1	30	375	6,050
2	16	500	2,200
2	24	475	3,300
2	36	425	4,898
2	60	375	9,130
2	120	325	16,500
3	90	375	12,320
3	180	325	20,900
4	240	325	24,200

The above rated powers permit of a continuous overload of 10 per cent. and a short operating overload of 20 per cent.

Another firm that has taken up the construction of surface-ignition oil-engines for fishing and other work-boats is Neufeldt & Kuhnke, of Kiel, one of whose engines is also illustrated herewith.

In connection with the work of standardizing the shipbuilding industry being arranged by the Dept. of Commerce, J. C. Shaw, of the Cramp Shipyard, and W. A. Van Essen, of the Pacific Diesel Engine Co., form the Diesel-engine committee.



30 b.h.p. Neufeldt & Kuhnke surface-ignition marine oil-engine

German Oil-Engines for Merchant Ships

By Professor Walter Mentz, Technische Hochschule, Danzig

FRIED. KRUPP, GERMANIA YARD, KIEL

MOTORENFABRIK DEUTZ, KÖLN-DEUTZ (*Cont.*)

Part of the fuel vaporizes immediately on entering the fuel chamber. In fig. 18 to the right is shown a channel slooping upwards, through which air can enter the fuel chamber. A small part of this air escapes during the suction stroke, together with a smaller part of the fuel in the form of vapor, through the small holes in the fuel chamber, so that a combustible vapor is formed round the latter. No more combustible vapor can escape from the fuel chamber during the next stroke because of the compression. The combustible vapor outside the fuel chamber is ignited shortly before the dead-center by means of the heat due to compression, and the flame projects into the fuel chamber through the small holes and ignites the fuel there. The force and increased heat due to this explosion drives the remaining fuel into the cylinder through the small openings in the side of the fuel chamber partly as liquid and partly as vapor. Combustion then takes place with help of the hot combustion air already present in the cylinder.

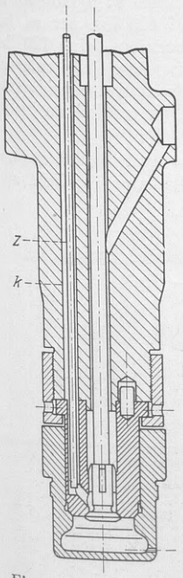


Fig. 19.—New type fuel valve of Deutz-Brons engine

The few disadvantages of this motor are that the ignition pressure is somewhat higher than in Diesel engines because the combustion takes place more or less in form of an explosion instead of with constant pressure, so that the design must be particularly robust; the fuel consumption is also somewhat higher than in Diesel engines. The motor has however the following great advantages especially for smaller outputs; it operates without electric ignition and without compressed air for fuel injection, no higher pressure compressor and no high pressure fuel pump being necessary. It is so simple that an unskilled operator can easily work it. It has the advantage over the hot-bulb motor that the dangerous heating of the hot-bulb with an open flame is unnecessary, the changing of the hot bulbs is also abolished and it is always ready for starting.

These works which until lately only built stationary Diesel engines have now in addition begun to build marine Diesel sets and motors for auxiliary machinery. They build smaller six-cylinder motors without cross-heads from 160 to 600 h.p., bigger motors, also six cylinder but with cross-heads, from 800 to 1800 h.p. and nine cylinder motors from 1150 to 2500 h.p.

One example of each type of engine, with and without cross-head, is given in the table at the beginning of this article. Fig. 21 shows two cylinders of the 1000 h.p. engine. The length of stroke is chosen rather small in comparison with cylinder diameter. The weight of the engine is about 440 lbs. per h.p. A peculiarity in this design is that each cylinder casing is cast separately in spite of not being of very big dimensions, and then coupled with the next cylinder casing by means of long flanges. The bed-plate likewise consists of five parts. Light, simple castings are obtained in this way; these castings can then be machined with smaller machine-tools. Too big water compartments are also avoided.

The bolts of the cylinder cover are inserted only in the upper wall of the cover, so that the usual sleeves for the bolts are avoided (this is clearly shown in the cross-section of the engine). The castings for the cooling water are, as is shown in the elevation through the cylinder, bolted on side by side of the suction—and the exhaust valves. This allows the cover to expand more freely through heat, and the stresses due to heat are also lessened.

The pistons are water-cooled at the circumference only, and have in the middle an interchangeable lining of case-hardened iron, which can freely expand and which assists the ignition through its high temperature. The cylinder liner consists exactly as in the Werkspoor engine, of which the lower part is bolted to the upper part, but can easily be removed in downward direction when the piston is to be withdrawn, see fig. 22. In this manner the removal of the cylinder cover is avoided with its complications.

The half-round brasses, which can easily be displaced after the crankshaft has been slightly raised, are not placed directly in the bed-plate itself, but in rectangular pieces with which the crankshaft can be brought easily into line by means of thin sheet-iron plates.

The camshaft is driven by an auxiliary shaft with three cranks. This shaft is arranged perpendicularly over the crankshaft, and not on the side of this shaft, as is more usual. The valve gear remains in this way at the correct angle even if the crankshaft should sink somewhat, and the correct play of the teeth of the spur wheels is obtained by inserting sheet-iron plates in the connecting rods of the gear. These rods transmit the rotation to another shaft arranged on top of the cylinders, which then drives the camshaft and the fuel pumps with a ratio of 2 to 1. A three-stage compressor is arranged at the fore end of the engine.

Much value is attached to easy removal of the crankshaft, fig. 20. The feet of the A-frames have a short removable piece below on the side of the guide. When the crankshaft is to be taken out the cross-heads are first bolted to the guides, the connecting-rods are thereupon swung outwards and kept in position by means of a bar of rope, the lower flange of the frame then lifted somewhat and the part shown by dot-and-dash lines removed; after which it is easy to take the lower part of the frames away, and each frame then rests on one foot only, which does not, however, cause too great bending stresses. The shaft can then be lifted by ropes and removed from the engine on guides on two H irons fastened to the bed-plate.

These works, which prior to 1915 had built stationary as well as marine Diesel engines, confined their production during the war to submarine oil-engines, and still are engaged only on marine engines. Construction of the stationary types in series is now taken care of at Essen.

The Germaniawerft builds engines from 100 to 950 b.h.p. without crossheads, in four different sizes and with two, four or six cylinders according to power, weighing from 180 to 210 lbs. per b.h.p. according to size. The six-cylinder engines are reversible, but the two and four-cylinder engines, which may be used also for driving compressors or dynamos, need a reverse gear

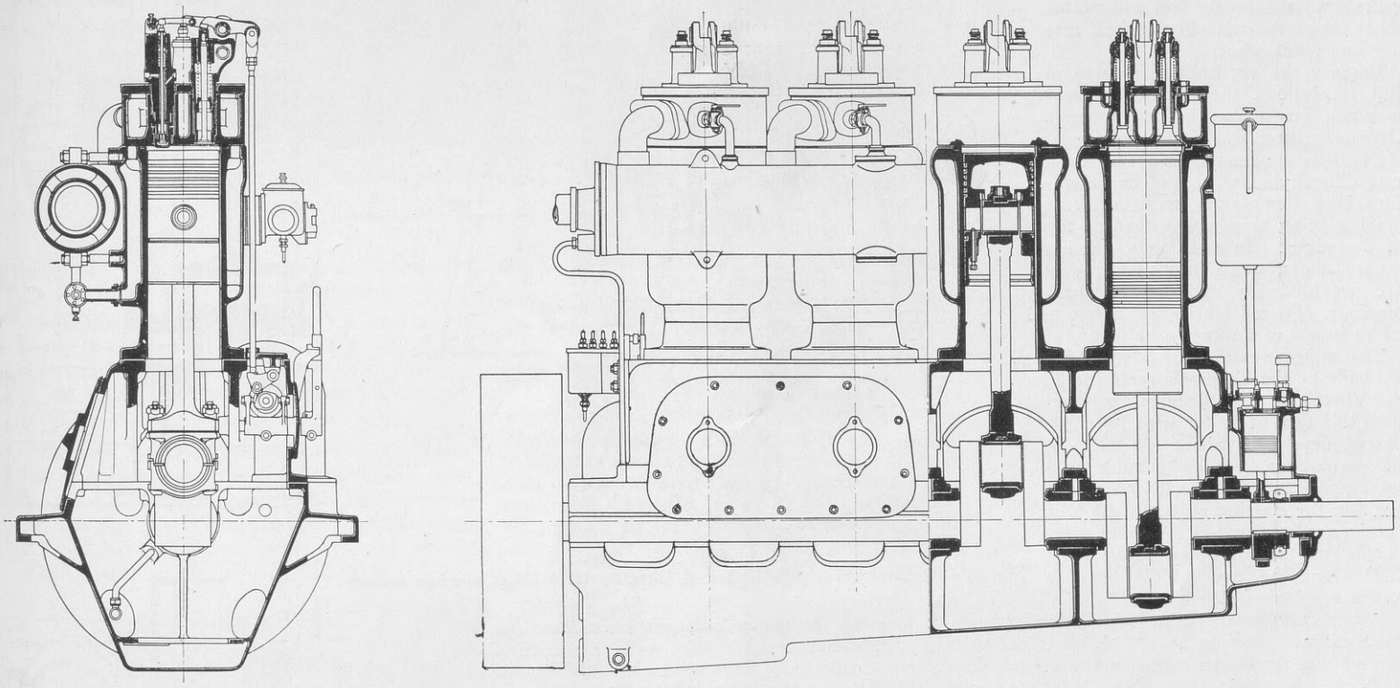


Fig. 18.—General assembly and sections of the Deutz-Brons engine

* Concluded from page 368, May issue.

or reversible propeller, the latter being designed up to a 1,000 b.h.p. size.

Standardization has been carried out in the smaller engines; for instance, the same size of fuel pump can be used for all cylinders. Importance is further attached to the suitability of the design for cheap production: thus surfaces to be machined are perpendicular to each other when possible, as in fig. 22; cylinders are cast in pairs, and so on. Rigidity of the engines is obtained by bolting the cylinder blocks securely together. The vertical gear shaft is driven through helical gears of large diameter, the result of experience from submarines, but bevel gears are used on the top end of the shaft where the reduction to half revolutions takes place.

Because the vertical shaft turns at full revolutions, the engine governor mounted on it can be made small. Originally there was a step-bearing at the bottom to support the shaft, but it was difficult to get at and has therefore been done away with, a thrust bearing being arranged instead on top of the engine. In addition to the big square doors, small inspection covers are provided for each of the main bearings. Forced lubrication is effected by means of a rotary gear pump.

The sailing vessel, illustrated in fig. 23, built by the Germaniawerft for F. A. Vinnen & Co., Bremen, is fitted with this type of motor with four cylinders, developing about 350 b.h.p. at 240 revolutions. As it is possible on a sailing ship to bring the fly-wheel into position for starting purposes, all four cranks are arranged in the usual manner in line, the two outer cranks being 180° from the two middle ones in order to obtain balance.

Krupp's also build six- and eight-cylinder crosshead engines, turning at 100 to 125 revolutions per minute, for bigger cargo and passenger ships with engine outputs from about 1,000 b.h.p. and upwards. The six-cylinder type of 1,400 b.h.p. at 125 revolutions is shown in fig. 24.

Water jackets are cast in blocks, each block having three separate cooling-water compartments, in which the liners are inserted. The two blocks are stiffly connected to each other by means of heavy flanges. Fig. 25 shows an end view of the engine and gearing mechanism.

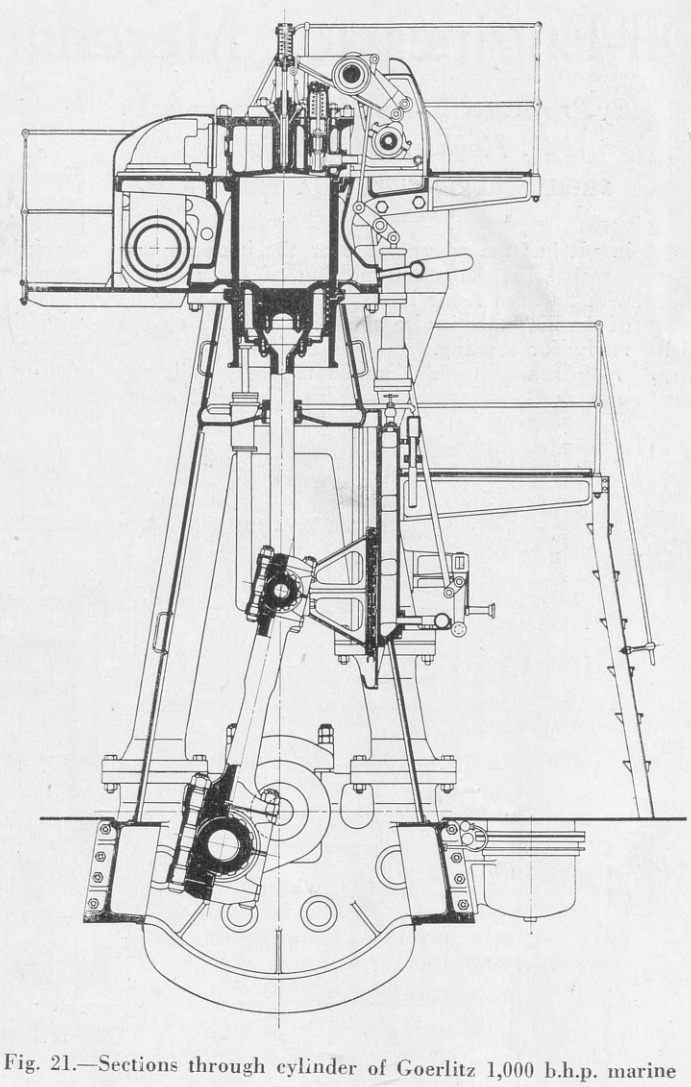
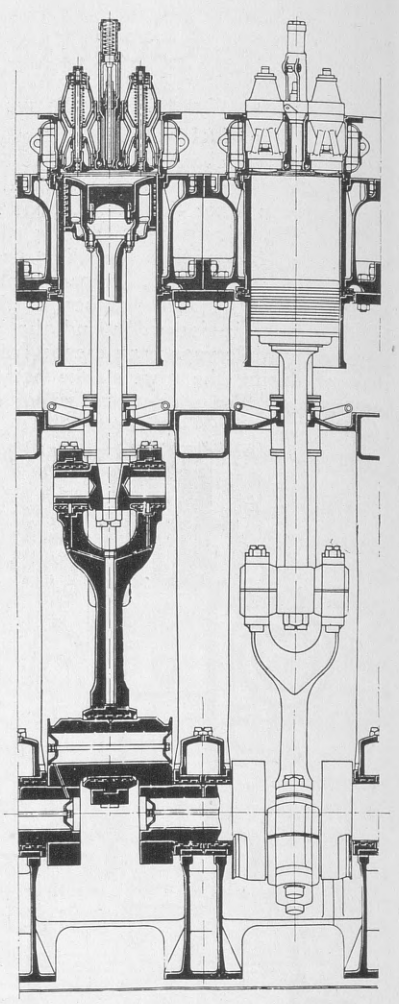
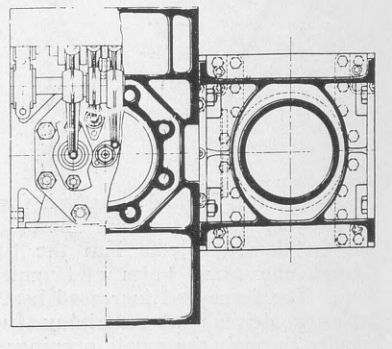


Fig. 21.—Sections through cylinder of Goerlitz 1,000 b.h.p. marine engine





Heat-shields with thin walls are used above the combustion chamber in the big four-stroke models in order to avoid cracks in the cylinder covers. This is an outcome of developments with the two-cycle engines in the motorship Zoppot built by the same firm. The heat-shield (see fig. 26) is of cast-iron and takes up the heat whilst the cylinder cover takes up the working pressure. The cooling-water is led to, and away from, the compartment through heavy tubes as shown by the arrows.

The cast-iron engine frames are placed right and left of the connecting-rod centers, spanning the main-bearings. They take up the whole working pressure, tie-rods not being employed on this engine.

For starting, only one lever is provided, as opposed to the usual arrangement. This lever operates the main starting mechanism, through which the starting valve levers of the different cylinders are connected with their respective cams. Fuel is injected into each cylinder right from the very start, ignition taking place on the first revolution, whereby sure starting conditions are obtained with a small amount of air.

Forged piston heads are used, turned on the inside face. Cracks due to heat are avoided and better cooling is obtained because of the thin walls of these forged pistons as compared with cast pistons. Sea-water is used for cooling, being led to and from the pistons through telescopic pipes of Krupp rustless steel.

The following fuel consumption was obtained on test with gas oil of 18,360 b.t.u. net heat value,

	Full Load	*Reduced Load*
I.h.p.	1,880	1,390
B.h.p.	1,412	1,007
Revolutions per min...	125.7	102
Mechanical efficiency..	0.75	0.73
Fuel consumption per i.h.p. hr.	0.315 lbs.	0.309 lbs.
Fuel consumption per b.h.p. hr.	0.421 lbs.	0.428 lbs.

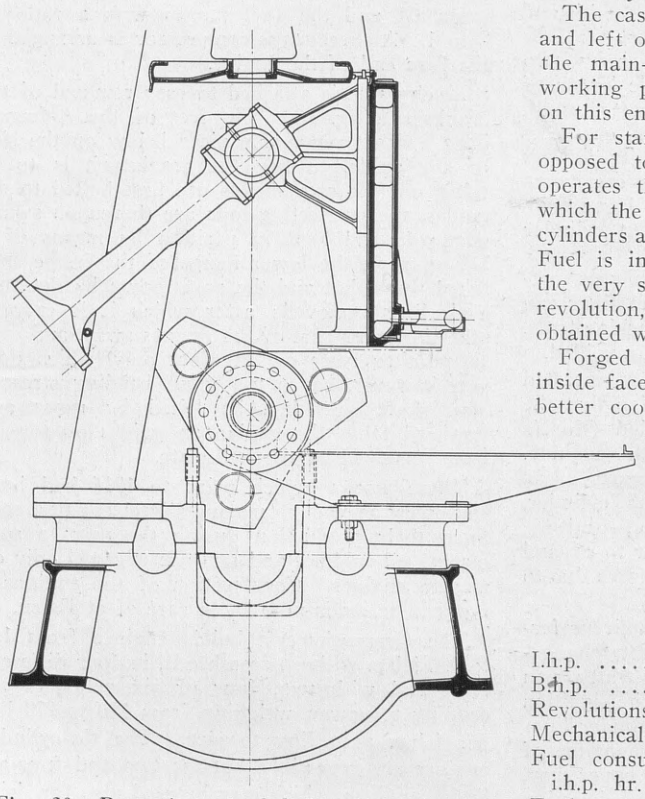


Fig. 20.—Removing crankshaft of 1,000 b.h.p., Goerlitz marine engine

Reversing from full speed ahead to full speed astern takes 8 seconds, and it was found possible on the test bed to start 10 times with 110 cub. ft. of air at initial pressure of 410 lbs. per sq. in., the final pressure in the receivers being 120 lbs. per sq. in. at the end of the test. The rules of the classification societies demand a considerably greater quantity of air to be carried on board ship.

For a twin screw ship having two such engines and including all pumps, dynamos for light and

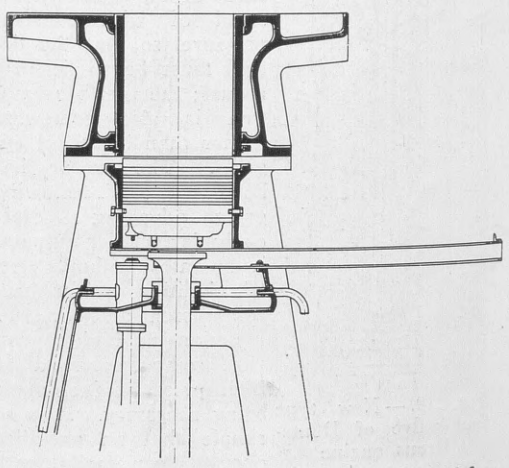


Fig. 22.—Removing piston of Goerlitz 1,000 b.h.p. marine engine

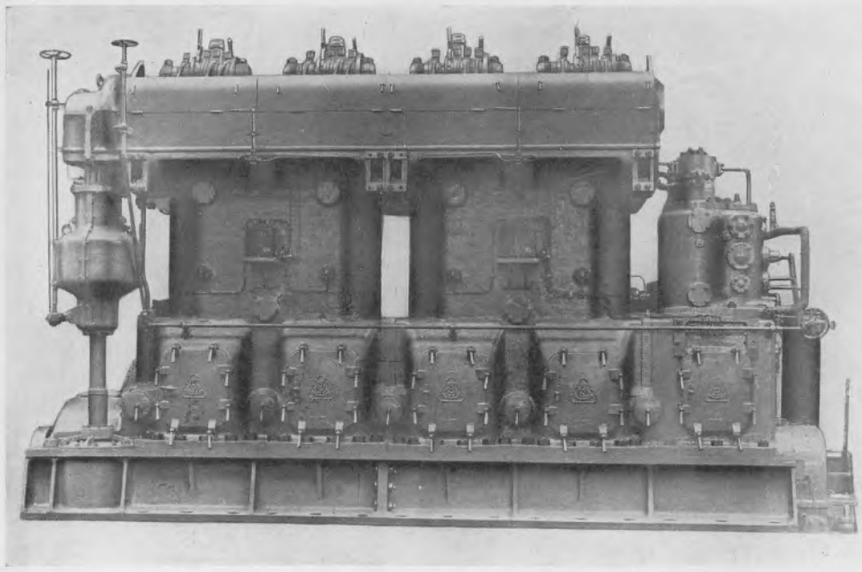


Fig. 23.—Germaniawerft four-cylinder trunk piston engine

power and auxiliary compressors, the weight amounts to 576 tons or 450 lbs. per s.h.p.

Two similar engines of 1850 b.h.p. each at 110 revolutions per min. are now being built for a twin screw ship. Each cylinder jacket, however, is cast separately, and all are then rigidly connected by means of heavy flanges.

Although at present Krupp's are building only four cycle engines, the two-cycle type is contemplated for bigger powers, and the Germaniawerft is for this reason continuing the development of that type, based on the favorable results obtained with the motor-tanker Zoppot.

Motorenwerke Mannheim A. G. vorm. Benz & Cie., Mannheim

This firm some years ago obtained a license for building the well known Hesselman two-cycle motor in Germany, and is still building it in sizes from 120 to 400 h.p.

In this design the cranks drive double-acting scavenge pumps, each of which has a compressor in tandem above; it is characteristic of the Hesselman engine to be started by the admission of starting air to the scavenge pumps alone, the cranks of which are set at 90°. In this way the starting air that becomes cold through expansion does not enter the cylinders and cool them off. The four cylinders begin working with oil at the same time that the scavenge pumps are being driven by air.

The valve gear is particularly simple because, it being unnecessary to change over from compressed air to oil for the working cylinders, the usual cylinder starting valves and eccentrics for the fuel valve levers and starting valve levers are rendered unnecessary. The scavenging takes place through ports, and each cylinder has therefore only one valve, namely the fuel valve.

A new type of smaller Diesel engine is being built with airless injection. The smallest size is 8 b.h.p. per cylinder and the largest 35 b.h.p. per cylinder. Fuel consumption in these types amounts to only 0.440 lb. per b.h.p. hr. under actual working conditions. The starting air is taken from the cylinders themselves in this engine. The valves are arranged inclined and driven by push-rods.

An original and interesting engine of 1,600 b.h.p., shown in fig. 27, has been built by this firm. This engine, which has levers instead of crossheads, is now on the test-bed. The chief aim of the design is to obtain a particularly short overall length with the usual vertical arrangement of six cyclinders. The cylinders are placed so near together that some of the bolts in the cylinder covers are used for two covers. The working pressures of the six pistons are transmitted through three cast-steel levers, tested hydraulically to 1½ times the working pressure of the piston with an allowable deflection of

$$\tan \frac{1}{1400}$$

The turning moment diagram is the same as with a six-crank four-cycle engine because two cylinders with ignition 360° removed always work together. The order of ignition is 1 3 5 2 4 6. Jamming of the levers under load is avoided by arranging big adjustable bearings on two adjoining frames. In the erection of these bearings care must be taken that they are horizontally ex-

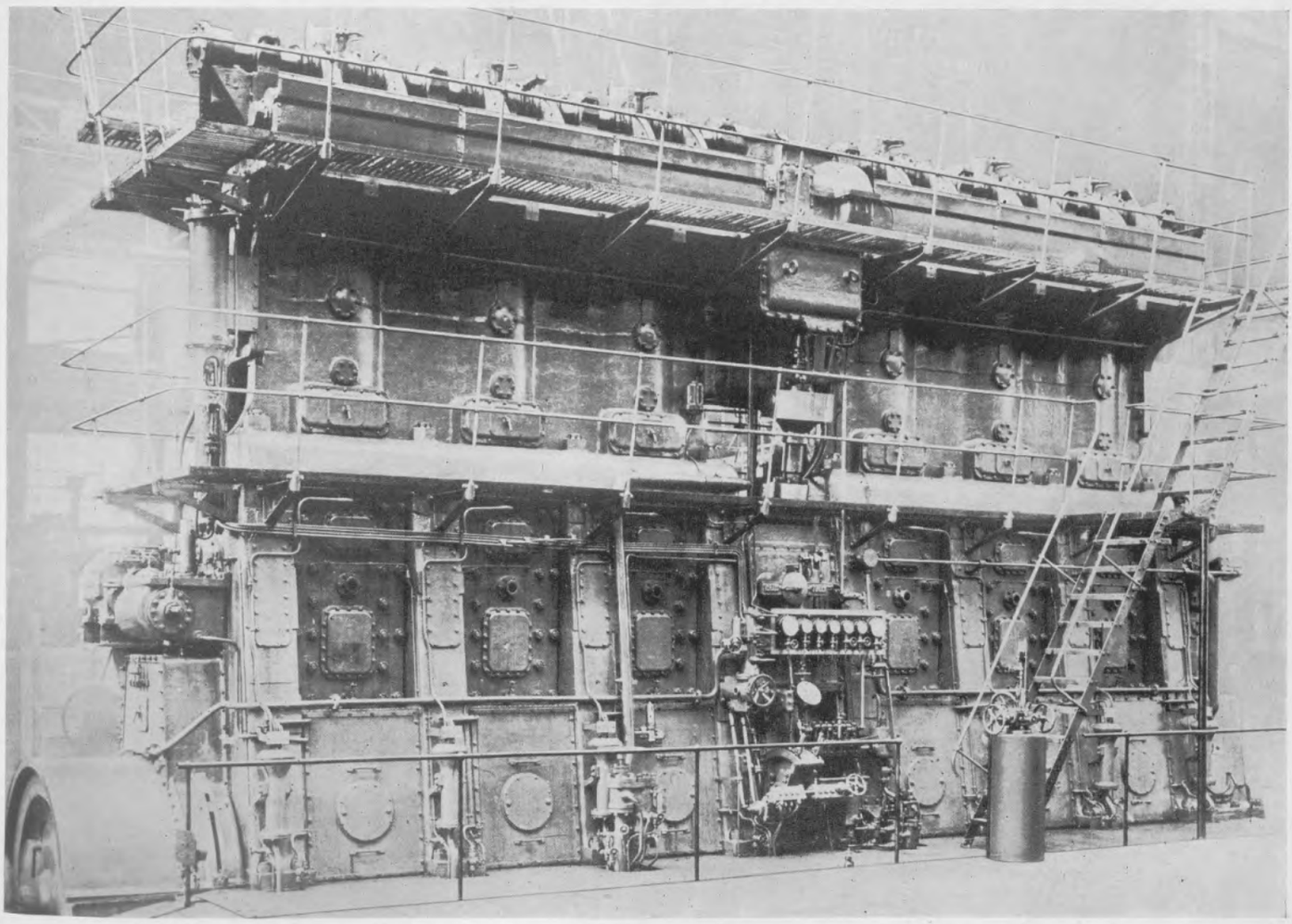


Fig. 24.—Krupp 1400 b.h.p. four-cycle crosshead engine now built at the Germaniawerft

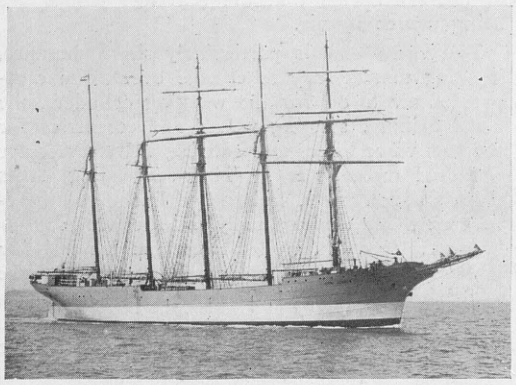


Fig. 25.—One of the Vinnen auxiliary vessels with Krupp motor

actly in line, but the erection of a crosshead engine is more difficult in comparison. Jamming of the pistons is prevented by fastening them to the rods in such a way that they can give freely. The pistons can easily be removed above or below.

The engine measures only 20′ 8″ between the outer edges of the foremost and aftermost main bearings, as compared with about 35′ 0″ for the usual six-crank arrangement of the same power. The engine is therefore not only very short, but also relatively light and cheap. Such a short engine will not have to resist stresses due to the unavoidable bending of the ship to anything like the same degree as the usual longer design.

The height of the arc which the swinging levers describe is very small. The resulting side pressures are therefore also so small that they can be taken up by the pistons themselves without these having to be made longer than usual for this reason.

Each lever drives a three-stage compressor arranged at the back of the engine. The compressors are so dimensioned that two are sufficient when running, and the third serves as reserve.

In other details of design this engine follows orthodox practice. Cylinder jackets are cast in pairs and the three castings then bolted together in order to obtain a rigid engine. All valve levers are made in two parts, so that the valves in the cylinder cover can be removed after taking off the ends of the valve levers but without disturbing the valve lever bearings.

This peculiar engine has, of course, certain disadvantages. It is a question if it will prove suitable under marine conditions and whether the engineers will take to the quite unusual designs. Those questions will have to stand the test of time. The forces due to the moving masses of the two pistons, piston rods and levers moving in the same direction are of course somewhat big, but are partly balanced by big counterweights on the cranks. There is thus no reason to expect the engine to run unevenly. It has been proved by tests in the works that the mechanical losses have been reduced by the lever system on account of the absence of crossheads and the reduction of the surfaces of the main and connecting-rod bearings. The mechanical efficiency was 79%, including the indicated work necessary for driving the compressors. If this latter work, which amounted to 8.5%, be subtracted from the other losses, then one finds that the mechanical efficiency is 87.5%. The fuel consumption amounted on test to 0.370 lb. per b.h.p. hr. including the power necessary for driving the compressors.

When the pistons were removed for the first time after the engine had been running for several months on test, there were no places to be seen that had to be tooled. The reason probably is to be found in the perfect freedom of their movement as compared with the comparatively rigidly connected pistons of the crosshead-engine. The pistons of this design of engine have the advantage over trunk pistons that they do not have to act as crossheads, but work with only a small sideways working pressure as explained above.

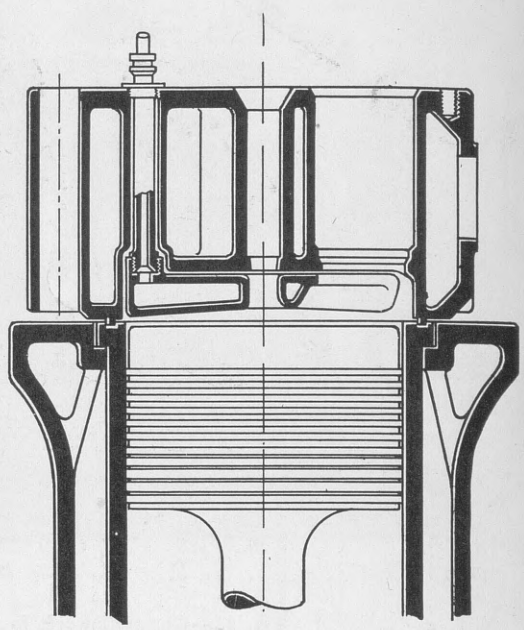


Fig. 28.—Krupp cylinder head

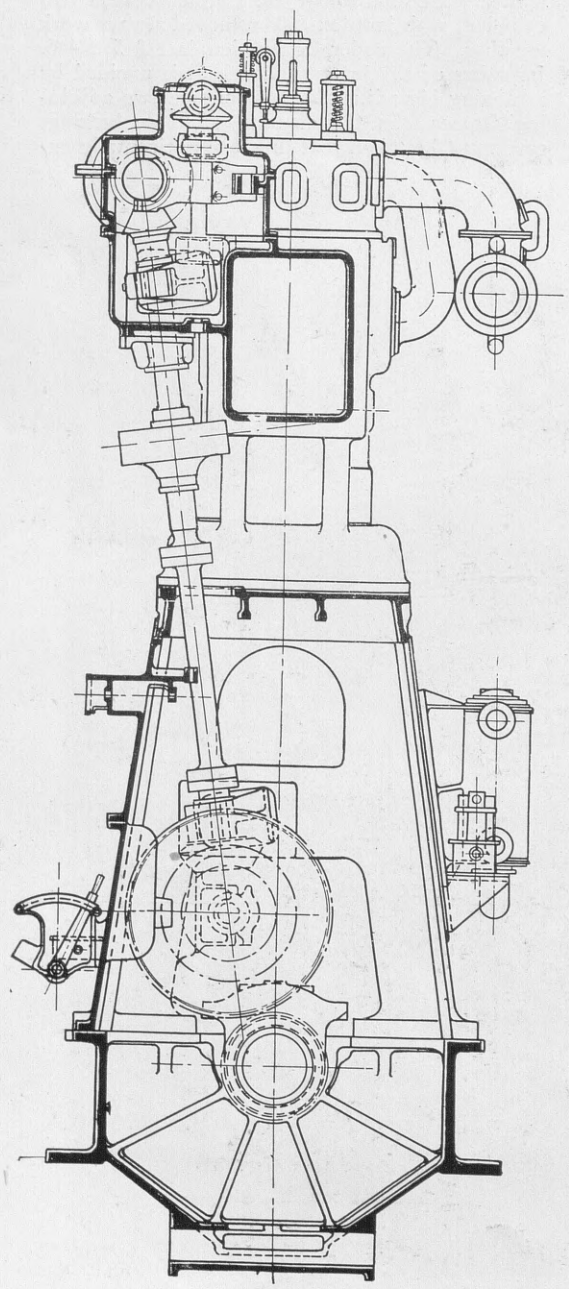


Fig. 26.—Krupp Camshaft Drive

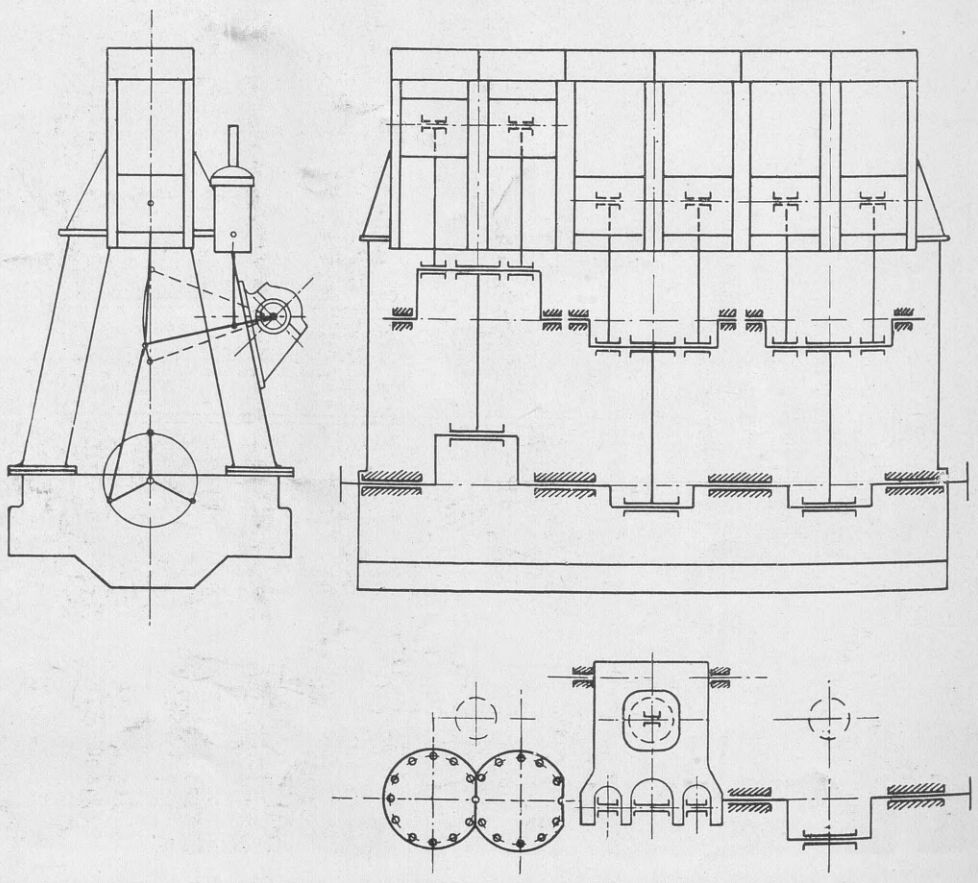


Fig. 27.—Diagram of new style Mannheim engine of 1600 h.p.